THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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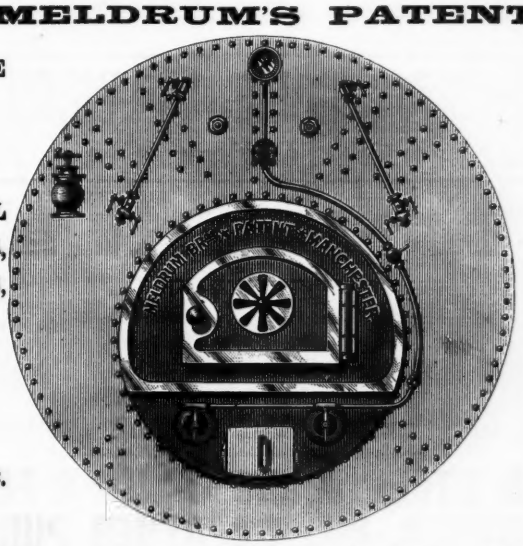

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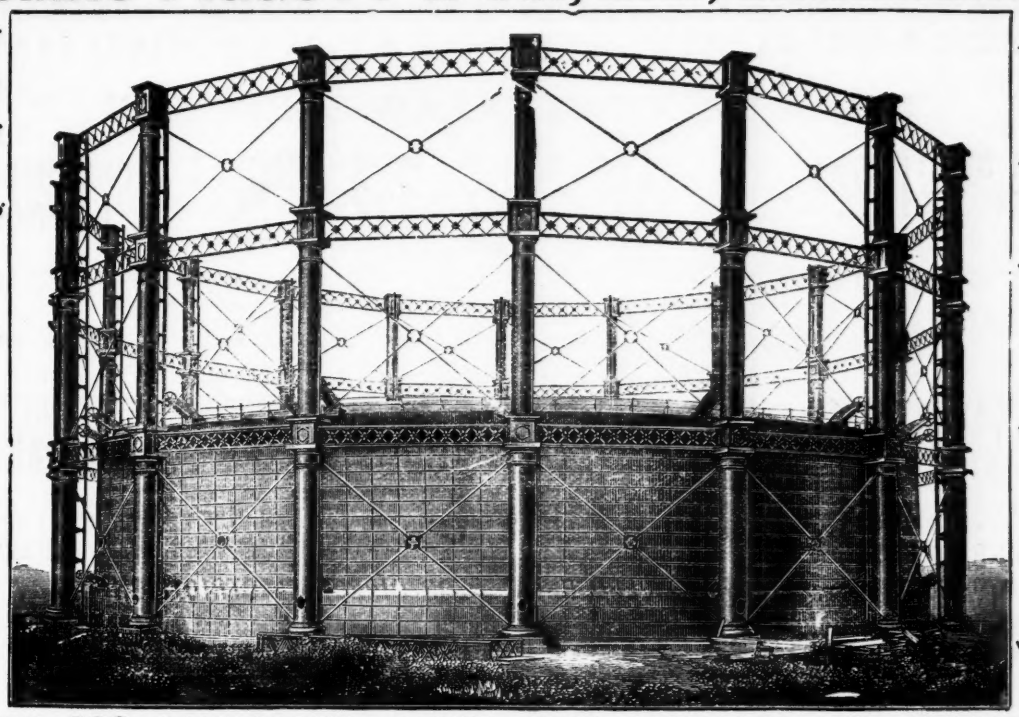

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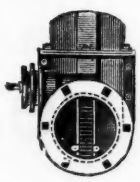

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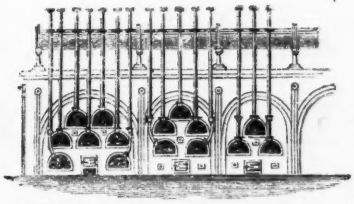

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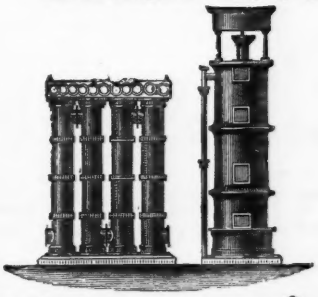

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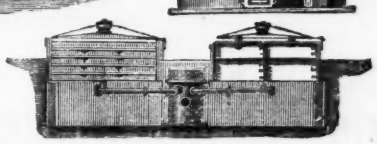

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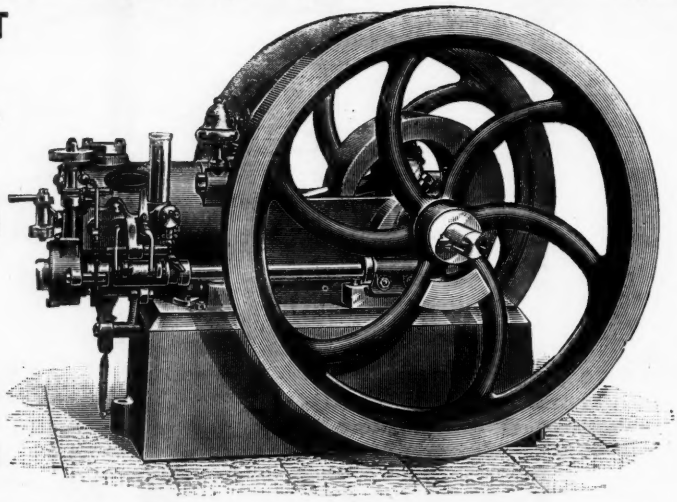

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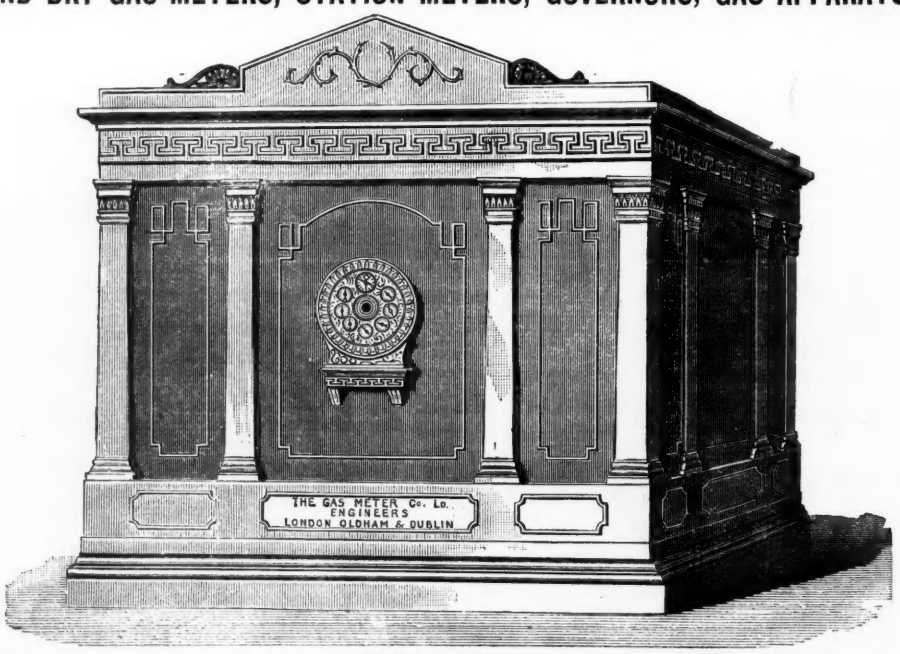

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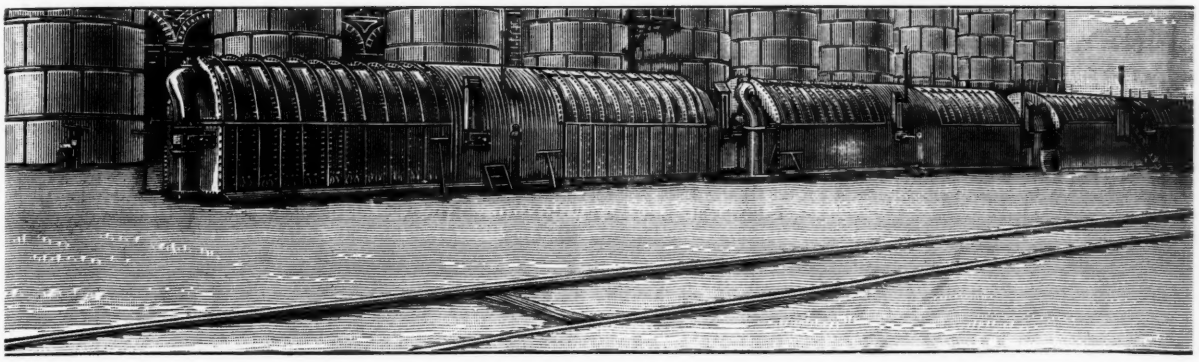

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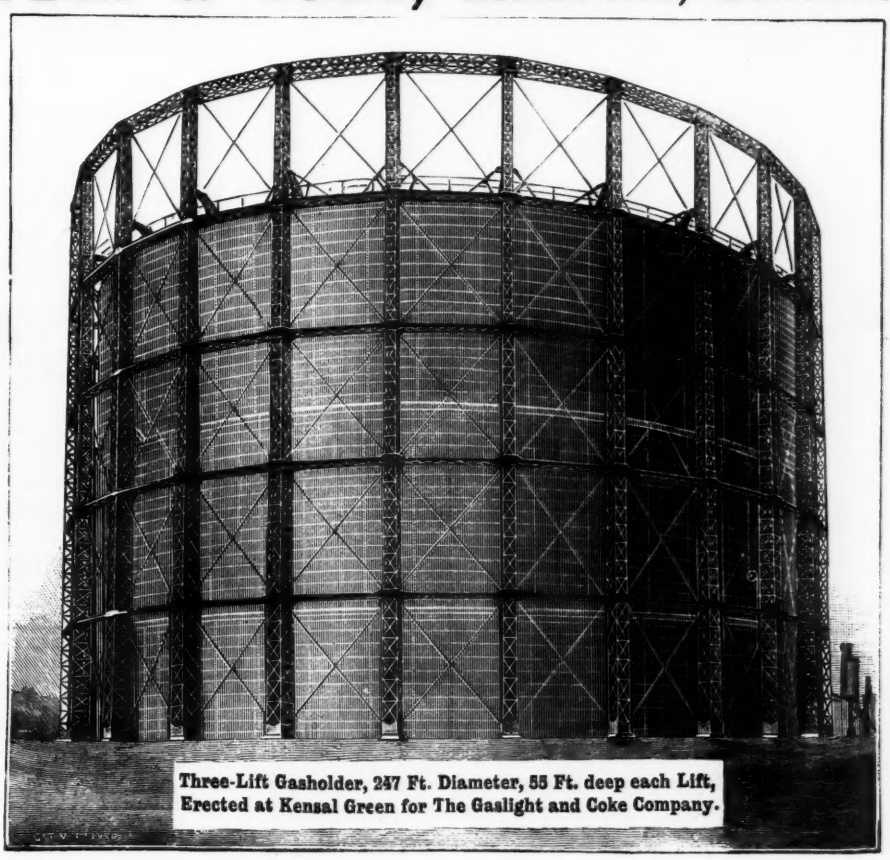

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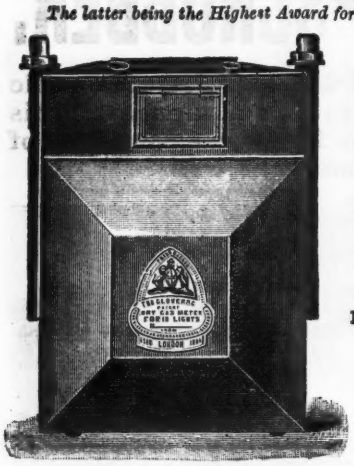

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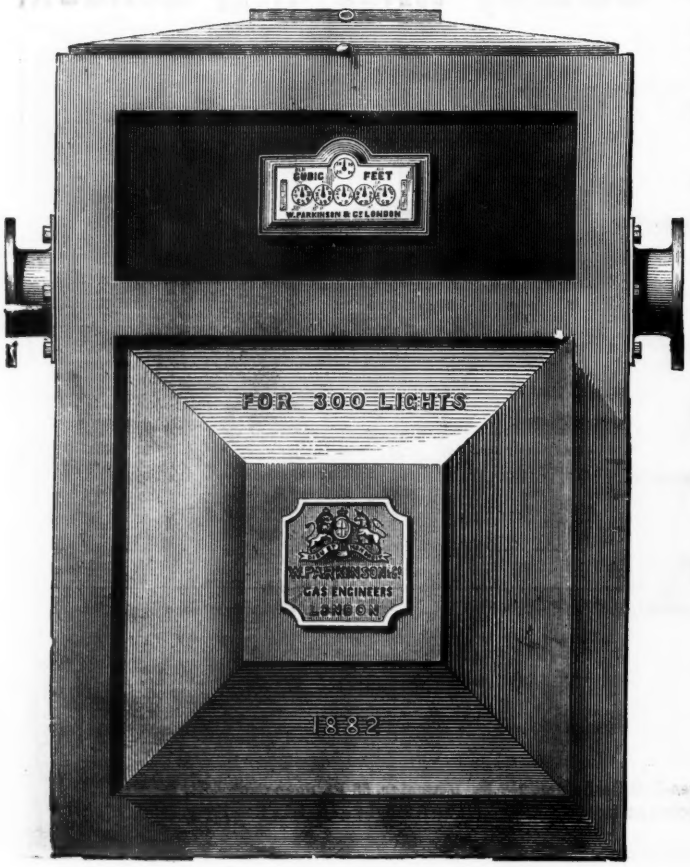

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TUESDAY, SEPTEMBER 12, 1893.

Outrages by Federation Strikers.

THE leaders of the Miners' Federation and their friends and admirers, who have been bidding the Universe admire the splendid behaviour of the "300,000 men" on strike by their orders, are fain to "sing small" to-day. At the time when the Magistrates in South Wales were endeavouring to keep the peace by timely reinforcements of the "strong "arm of the law," for which they were roundly abused by the demagogues and their press partizans, the latter held up the state of the Federation districts as a bright example of the power of Trade Unionism to settle wages disputes quietly, and without the slightest danger of damage to persons or to property. The importation of extra police and military into South Wales was denounced as provocative; and all sorts of horrid consequences to the State were predicted if a shot was fired in defence of the cause of law and order. The irony of Fate has turned against these advocates of uncontrolled Unionism; and it has once more been shown, by the lurid light of incendiarism and outrage, that no civil authority is justified in allowing mobs to get headway, whatever the principles professed, or the objects aimed at, by the nominal leaders. Alderman Sim Tappertit may possibly in these days aspire to a seat on a County Council, or even in the House of Commons; but the mob which he affects to control will be too much for him in this Nineteenth Century, as it was in the time of his prototype. The doings in the Dewsbury district last Thursday, to name only one case, supply a lurid commentary upon the boastings of Mr. Sam. Woods, M.P., in his *New Review* article, which is noticed elsewhere. Dewsbury, however, pales before Pontefract, where the military actually fired upon the mob; and only the despatch of about a thousand Metropolitan constables to Nottingham prevented an outbreak of violence in this district.

The simultaneous uprising of evil-disposed mobs in different parts of the country, throwing to the winds the peaceable pretences under cover of which the Federation men have been allowed to meet and march about to their hearts' content, is a striking feature of the outbreak. The authorities were generally caught unprepared for anything of the kind; and before blaming them for this, it is only fair to remember that they may have been influenced by the protestations of the Union leaders, and otherwise pardonably averse to incurring the odium of making an unnecessary display of force. They will, however, know better for the future how little reliance is to be placed upon the Pickards and Woods and their like. It is not the vapourings of a Keir Hardie in the House of Commons that will prevent such outrages as that of the wrecking of Lord Masham's colliery being repeated throughout the Federation district, if opportunities are given by the supineness of the Magistrates to the disappointed dupes of the Federation leaders. The men are losing the economic battle; and this outburst of mob violence is the old-fashioned, non-progressive way of showing the fact. It is only too true that if the most "Progressive" of the New Unionists is scratched, the same old savage is discovered who might have marched to London under Jack Cade, for all that he has learnt of justice and reasonableness in his turbulent moods. The men are losing; and the consciousness of defeat is being brought home to them very early in the campaign, by the disappointed discovery that their leaders have deceived them by loud talk while the exchequer was well-nigh empty. If the employers' position is sound, as we believe it to be, the men were bound to give in sooner or later. How long they could stand out against the inevitable has only been a question of time; and the time has turned out lamentably short.

There will be a day of reckoning shortly for the Federation wirepullers. According to Mr. Sam. Woods, the Federation commands the support of 300,000 men. This is given at all events as the number of men rendered idle in consequence of the action of the employers last month. Assuming 200,000 of these to belong to Unions—for we must give to Union men credit for constituting the majority—and remembering that the Federation claims to have ruled the roast for the past five years, it might naturally be imagined that the Federated Unions would have a good bit of money laid by for an emergency. For the ordinary contribution of a full member to the "trade purposes fund" of his Society is 3d. per week. Sick and funeral benefit funds are extra; and there is usually an entrance fee to be paid for the card. It, therefore, appears that the Miners' Federation, which Mr. Woods calls the "most powerful trade organization in "the world," ought at the beginning of the strike to have had command of the capital sum composed of the weekly threepences of 200,000 men accumulated for five years, which amounts to £650,000. This is exclusive of interest and also of whatever capital the Unions may have started with. As a matter of fact, the Federation could not have had a fraction of this capital to depend upon. Where the money has gone, is not for us to say. As it is, the capital which might have been useful to the men for fighting their employers in detail, if some few of the latter were disposed to be unfair, has gone in a fortnight, and nobody will be one penny the better for it.

A Point in the Law of Rating.

ANOTHER chapter in the involved history of the assessment of hereditaments for the relief of the poor was closed on Friday last by the delivery of the judgment of the House of Lords in three appeals that have been standing over for decision for some time, in which the question at issue was as to the rateability of the sewage outfall works belonging to the London County Council. The principle at stake was the liability to rating of hereditaments which are not held for the purpose of making a profit; and it will thus be seen that the treatment of sewage works was not the only thing to be thought of in connection with these cases. It is obvious that a sewage outfall is not an establishment for which a hypothetical tenant could be found, if all other considerations are to be rejected. The position that was taken by the Assessment Committees in these cases is, however, that, supposing they had to hire even an unprofitable sewage outfall from somebody else, the County Council would have to pay something for it. On the other hand, the County Council contended that they should only be rated in respect of the value of the land and buildings if used for other than sewage purposes. There has been a conflict of opinion between the Courts over the point at issue; and now the House of Lords have decided against the County Council. In delivering judgment, the Lord Chancellor remarked that the question of the rateability of pumping stations has hitherto been left in a most unsatisfactory condition. Up to a certain era, the decisions of the Courts upon this class of cases were all vitiated by the supposition, since exploded, that lands held for public purposes are on this account not rateable. It is now laid down that the circumstance that land is held by a public body for a public purpose does not affect its rateability. Moreover, it is not essential to the condition of rateability that a particular occupier of the land can make a profit by the use to which he is putting it. It is rateable whenever its occupation is of value. Otherwise, a Corporation gas undertaking might escape rating, if it could be shown that the gas is sold at cost price. This settles the question of the rateability of unprofitable public works. Upon what principle the assessment of such properties ought to be made, and what considerations are proper to be taken into account, are questions which the Lord Chancellor admits to be involved in much greater difficulty. He finally concluded, after a masterly survey of cases in point, that the right principle of valuation is to take into account the rent which the owner and user of an unprofitable but necessary public work would be willing to pay for it, supposing it to have been supplied by somebody else. The Lord Chancellor also holds that underground sewers are not rateable. This exemption cannot be logically defended; but the Lord Chancellor adopted it as the less of two evils, and as being consistent with a practice which has prevailed for a very long time, and has received judicial sanction. A sewer carried on the surface of land, which is thereby appropriated to this particular purpose, is, however, rateable. The notable feature of this judgmeet is its establishment of the principle that there is no legal obstacle to regarding the owner of a hereditament as his own hypothetical tenant, where the circumstances forbid the prospect of obtaining another tenant. It also strengthens the distinction already existing between a valuable and a profitable occupation, while re-affirming that both are rateable, and that if a hereditament cannot be assessed under one category, it can be included in the other, so long as any use whatever is made of it.

The Trades Union Congress.

THE Trades Union Congress has been in session in Belfast throughout the past week; and the debates and resolutions of the delegates who constitute this very curious assembly have been followed with much interest by the newspapers. Some of the gentlemen of the press who attended the meetings have expressed their surprise at the appearance and demeanour of some of the professional "working men" figuring as representatives of certain Unions; and it is difficult to say, if Dr. Aveling's claim to be what is commonly known as a "working man" is to be allowed, where the line is to be drawn. As was remarked in these columns last week in anticipation of the Congress, the assembled Trades Unionists have been amusing themselves by discussing, in five-minute speeches, and passing numerous resolutions which are mainly of importance as indicating the tendency of opinion among the nondescript order of professional agitators. This is somewhat humorously called the "business" of the meeting; but what is likely to be the good of it all does not appear. The newspapers seem disposed to make a point of the fact that the Socialists obtained the endorsement by the Congress of the principle of the "collective ownership and "control of all the means of production and distribution," which was a distinct triumph for Mr. Ben Tillett, who took the occasion to remind the people of Belfast that they are "Socialist in so far that they own the local gas-"works." On the other hand, the Congress administered a rebuff to Mr. Keir Hardie, M.P., whose proposal to commit Trades Unionists to the policy of the Independent Labour Party was rejected. The Socialists did not have all their own way at the Congress; for their nominee for the office of Secretary to the Parliamentary Committee was rejected, and their proposal to hold the annual "Labour Day" celebration on a Sunday, although strenuously supported by Mr. John Burns, M.P., was also lost. Mr. W. Thorne, of the Gas Workers' Union, was instrumental in eliciting the information that the cost of sending the four delegates of the Parliamentary Committee to the late farcical Zurich Conference was £73. It is not a great sum; but the disclosure shows how these practical gentlemen fritter away the funds entrusted to their care, presumably for serious purposes. Now that the talking at Belfast is over, it is to be hoped the lights of the Miners' Federation who have been spending a tolerably pleasant week in the North of Ireland will be able to devote a little time to helping the authorities to suppress the riots in the Midlands.

Judging at the Chicago Exhibition.

SOME of our American friends have taken it unkindly that we should have ventured to express the opinion that not many British gas engineers will be found to accept the Chicago Exhibition as a particular inducement to visit the United States this year. Up to the present hour, however, we happen to be justified by the result, for not a single British gas manager has been able to take advantage of the hospitable arrangements of the Reception Committee of the American Gaslight Association; and there is no prospect of much change in this respect for the remainder of the time during which the great show is to continue open. Possibly this shyness may be due to the boycotting of the national industry of gas lighting by the Exhibition authorities themselves; but we wish we could succeed in persuading friends on the other side, of the existence of the more important influence—that the exhibition idea has lost its attractiveness when embodied outside the ever-pleasant City of Paris, which needs no such adventitious bait for the tourist. Many people have abused the Chicago enterprise for sundry and manifold reasons; and the exhibitors have waxed very wroth and sarcastic over the system of prize awards favoured by the administration, but subsequently abandoned, as it seems, for the indiscriminate bestowal of medals upon whoever would receive them. We derive our information upon this latter subject from the statement of Mr. Conrad W. Cooke, who was nominated as one of the judges by the Royal British Commission, but found it impossible to carry out the duties pertaining to the office. This gentleman stated that, according to the instructions he received, each judge was required to examine every individual object shown by every exhibitor in his section, and report in writing thereon, stating his reasons for giving or withholding an award to that particular object. He had moreover to prepare an abstract report upon every object examined, such abstracts to be inscribed in the exhibitor's diploma, while the full reports were to be published afterwards as part of the literature of the exhibition. It will strike many people who may have cherished the delusion that exhibition prize awards mean something, that the above is the least a conscientious judge could do. But Mr. Cooke has denounced the conditions as "altogether impracticable;" and doubtless he is quite right. It may soothe some of the susceptibilities of those whose national self-esteem has been wounded by the depreciatory remarks that have been put in currency about the Chicago show, if we declare that, in our estimation, the scheme of judging proposed was originally one of the best features of the exhibition, and should be easily defensible upon the assumption that the prize awards in connection with these exhibitions are

really for merit. It has now been published abroad that the facts are different; and whatever else the Chicago enterprise does, it will deserve the thanks of the industrial world for putting an end to the farce of prize awards for exhibits. It is remarkable that most of the foreign visitors to Chicago seem, by their reports, to linger amid the peep-shows of the Midway Plaisance, in preference to doing their duty by the more severe exhibits in the Hall of Manufactures. The American exhibitors have expressed their dissatisfaction with this manifestation of frivolity; but what would you have? There is a period when the glamour of the biggest fly-wheel on earth fails to attract, and when the heaviest pile of horse-shoe nails ever got together under one roof gets wearisome to the beholder. Then comes the showman's opportunity; and he takes it, and the sightseer's dollars, for just the same hackneyed old diversions that amused weak humanity long ages before Chicago was ever heard of.

Gas-Lamps as Weather Indicators.

An ingenious Scotchman has discovered, as he avers, that street lights are valuable indicators of the state of the atmosphere, and can be made, by observation conducted upon certain principles, to furnish data capable of being used for weather forecasting. This gentleman is in the habit of taking note, during his evening walks abroad, of the character of the irradiation from street-lamps in what landscape painters call the "middle distance;" and he believes he has succeeded in defining the different appearances that attend upon saturation or dryness of the atmosphere, imminent frost, and so on. Whether or not the appearance of a public lamp at a distance of a hundred yards or so will be the same to any number of observers, or how it is affected by the condition of the glass of the lanterns—to say nothing of the number of glasses of another kind through which the meteorologist may have looked during the evening—are curious questions that can hardly be answered off-hand. It is well known to the more observant of town dwellers that distant street-lamps do appear different under varying weather conditions, and that a shrewd guess as to the imminence of rain or frost may sometimes be made from such observations. Like all other weather indications, however, those drawn from the colour and distinctness of street lamps can only be trusted within very narrow limits. Those who are accustomed to watch the weather, either in town or country, do not depend for their forecasting upon any single phenomenon, but speak from a sort of instinct or "feeling" of what the weather is likely to be; and then they are as often wrong as right. The whole problem of weather forecasting, also, is overshadowed by the mysterious influence only to be classified as the character of the season. There is a proverb which says "When God wills, all winds bring rain;" and this is as nearly the perfection of weather wisdom as we can yet pretend to. In a dry season like the present, street-lamps may gleam, distant light-points shine as if close at hand, and other indications of coming rain may combine to persuade the City man that at last his inseparable umbrella will have some justification for its existence; but all may be illusory.

Presentation to Mr. and Mrs. F. J. Baynes.—The recent marriage of Mr. F. J. Baynes, the Manager of the Ystrad Gas and Water Company, to Miss Lewis, cookery instructress (from the South Kensington School of Cookery) to the Ystradyfodwg School Board, was taken advantage of by the employees and a few of the townspeople to show, in a tangible way, their esteem for the bride and bridegroom. A large company was invited to meet the happy pair at a dinner at the Pentre Hotel last Friday evening; and in the course of the after proceedings, the presentation was made. The gifts consisted of a handsome marble clock, a pair of bronzes on pedestals, and a gold bracelet with padlock, in addition to which a suite of old oak furniture had already been given them. It may be here stated that Mr. Baynes was appointed General Manager of the Ystrad Gas and Water Company in 1888; he having been previously under the Corporation of Bolton. During the five years, the make of gas per annum has increased from 49,500,000 cubic feet to 66,250,000 feet; and there has been an increase of 1760 in the number of houses supplied with water. To enable the Company to cope with these large increases, the gas-works have been greatly extended and remodelled under Mr. Baynes's supervision, while the water-works have been enlarged under the superintendence of Mr. T. Rees, M.Inst.C.E., of Newport.

WATER AND SANITARY AFFAIRS.

The proceedings at the Thames Police Court, before Mr. Rose, in which the East London Water-Works Company were summoned at the instance of the Improved Industrial Dwellings Company, have resulted in a magisterial decision which is certainly characterized by good sense, and which we trust will also be vindicated as correct in law, should the case be carried before a Superior Court. As many as nine summonses in all were taken out; and the East London Company were charged with having "unlawfully neglected or refused" to furnish a supply of water from August 19 to 23, to certain tenements in Morrison's Buildings South, situated in Whitechapel. The internal arrangements for the conveyance of the supply to these particular tenements were somewhat peculiar. At the top of the building were sundry tanks, originally placed at an elevation less than 40 feet above the level of the pavement, but subsequently removed to an altitude of 53 feet. When this alteration was effected, it was arranged that the second floor should take its supply from the rising main. At the same time the Water Company's Engineer distinctly warned the representative of the Industrial Dwellings Company, that the East London Company could not guarantee to raise the water to the statutory height of 40 feet in times of drought and frost. But the evidence given by Mr. Bryan as to the pressure in the mains on the days in question, showed that if the stop-taps in the building were open, there would have been enough water in the tanks to supply the tenants. As bearing on this point, a very conclusive statement was made by William Wellar, the porter at Morrison's Buildings. He said that on each of the days concerning which the East London Company were summoned, he "examined the tanks, and they were full, except "on the 19th; but on that day at 6.30 a.m. there was "water in the rising main, and again at 9.30 p.m." Certainly this did not look as if the defendant Company were "unlawfully neglecting or refusing to furnish a supply of "water." There was water in the building, and at the highest point, except perhaps on Aug. 19, when the water came on in the evening. The complaint that water could not be obtained came from the occupants of the second floor, whereas—with possibly an exception for part of one day—there was water enough and to spare higher up. The East London Company were under no obligation to send a supply to a higher level than 40 feet, neither is it clear that they were under compulsion to give a constant supply. Even if they were legally liable to provide such a supply, they were not summoned for any alleged default in that respect.

A remark made by the Magistrate in the course of the proceedings against the East London Company calls for notice. The summonses were obviously taken out under section 43 of the Water-Works Clauses Act, 1847. Mr. Rose quoted the words which say that a supply should be given "during any part of the time" for which the rates had been paid or tendered. On this, his Worship suggested that the Company "must supply at any moment." Mr. Rose did not exactly adopt this idea; and perhaps on reflection he would reject it. The meaning of the section can only be that a consumer shall always be "supplied" with water. It is not needful to suppose that the pipes shall always be charged, so as for the water to be ready to flow into the tank "at any moment." If there is water in the tank, the consumer has what he wants. If this is not the meaning of the Act, why need there have been any further legislation to secure a constant service? However this may be, the whole drift of the evidence in the East London case is to show that a supply was actually given. If water reached the tanks, it must have gone up through the rising main; and the evidence of the aggrieved tenants seems to have been that they were only able to get water from the rising main early in the morning and in the evening. That it was desirable for them to have a constant supply may be admitted; but there was a supply of water nevertheless on the premises. Mr. Bryan suggests a very direct remedy when he says: "If the complainants would "provide proper storeage, there would always be an "ample supply for the whole of the tenements throughout "the day." In the northern range of Morrison's Buildings, the whole of the supply is taken from cisterns; and no inconvenience seems to have been experienced in that quarter. The difficulty in regard to the southern range

arose from an undue dependence on a constant supply. The enormous demand which the Company had to meet, owing to the extreme heat of the weather, rendered it impossible—with due regard for the public safety—to maintain any other than a good supply of an intermittent character. The Magistrate considered there was proof that on one or more days there was an insufficient supply of water to the tenements. For this insufficiency he did not consider the "drought" could be correctly pleaded. But there were "unavoidable causes" at work; and hence he considered that the exception clause in the Special Act was applicable. The Company had done "their best" to overcome a state of things brought about by the exceptional circumstances arising from the unusual heat of the weather. On this ground, the summonses were dismissed. Even a London Water Company cannot be called upon to do impossibilities. What has happened here is what Mr. Bryan predicted some time ago; and the remedy rests with the Improved Industrial Dwellings Company, whose arrangements concerning the water supply apparently require to be somewhat further "improved."

Death of Mr. A. Thorns.—The death is announced of Mr. Abraham Thorns, of Leeds, for many years the representative in the South of Messrs. Alder and Mackay, of Edinburgh, and the Farnley Iron Company. Mr. Thorns had been in ill-health for a considerable time previous to his death, and had not been able to attend to any business since about April last. The immediate cause of his death, which occurred last month, was cancer in the stomach.

American Water-Works Association.—Newspapers to hand last week from the United States contain particulars of the programme of business to be discussed at the then forthcoming meeting of this Association, which was to be held at Milwaukee from the 5th to the 9th inst. The papers to be submitted were to bear the following titles: "Analyses of Public Water Supplies, with Suggestions for a More Exact and Uniform System;" "Municipal Acquirement of Private Water Company Plants, as Illustrated by the Syracuse, N.Y., Water Company, Condemnation by the City;" "Driven Wells, Supplementary Supply to Brooklyn;" "Incidents in Water Supply Tests;" "The New Orleans Case;" "Details of Construction of High Earthen Dams for Storeage Reservoirs on the Pacific Coast;" "The Office of City Civil Engineer in Small Cities:" "Damages for Appropriation of Streams;" "Covered Service Reservoirs;" "The Geology of Wisconsin Water Supplies;" "Is Our Drinking Water Dangerous to Health?" "Some Experience Regarding Deep Wells."

A Pneumatic Balance Fire-Alarm.—MM. Delahaye and Boutille have exhibited before the French Academy a fire-alarm, which also indicates the presence in the atmosphere of a dangerous proportion of coal gas. It consists of a hollow ball of aluminium, 15 to 20 millimetres in diameter, supported at one end of a lever arm, with a counterpoise at the other end; the whole being in equilibrium at the ordinary temperature and pressure of the atmosphere. The apparatus is purposely made not sensitive enough to be affected by ordinary and natural changes of temperature and pressure; but if the specific gravity of the air becomes seriously diminished, either from a dangerous rise of temperature due to fire or an admixture of coal gas in sufficient quantity to become explosive, the balance is destroyed, and the ball in falling completes an electric circuit by which an alarm bell is set ringing until the normal conditions are restored. The device has the appearance of having been suggested by the well-known gas-balance, from which, however, it differs in an obvious respect. It supplies another example of the adaptability of aluminium to the construction of scientific instruments combining lightness with strength.

Testing Degrees of Lighting in Interiors.—A simple optical photometer, serving also to measure the degree of visual acuity, has recently been devised by Dr. Simonoff (says the *Scientific American*). A book of twenty-four pages is arranged; the first being of a clear gray tint, the second of double the intensity, and so on to the last, the colour of which is nearly black—being twenty-four times the intensity of the first. On every page are printed a few phrases in black letters of different sizes. The amount of illumination available in a badly-lit apartment may be estimated by turning over the pages of this little book, held at a distance of about a foot from the eyes, until one can no longer read the line of letters of a selected size. With good illumination, the characters on the twentieth or even the twenty-fourth page may be read; but with poorer light legibility ceases at the tenth, the twelfth, or the fifteenth page. The appliance is meant for indoor use exclusively; and it must, of course, be employed with intelligent reference to the power of the eyes of persons making the test. But it is said to give fairly reliable comparative indications of the degree of lighting in a building; and it may thus be useful in ascertaining the sufficiency of the lighting of class-rooms and public buildings intended to be used for educational purposes.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 501.)

THE tendency towards improvement in most departments which was noticeable in the Stock Exchange a week ago has been well maintained during the past week, although perhaps it might still be desired that more material progress could have been effected. The general characteristics were much the same as those of the preceding week—American rails again setting the keynote for the rest of the markets. This feature, coupled with the increasing cheapness of money, produced a degree of cheerfulness; and prices were better all round for the most part, though there was not sufficient activity to cause any marked movement. The unfavourable factors *per contra* were the violent and protracted struggle in the coal trade, and some uneasiness with regard to affairs in Brazil; while the fact of yesterday and to-day being Jewish holidays accounted for extra quietude towards the close. The position of the Money Market was remarkable. Money fell in value, almost every day, to an appreciable extent; and the difference between the Bank rate and the open market was wide in the extreme. A reduction in the former was pretty confidently expected on Thursday; but in the result the Directors resolved that it would be more prudent to leave it as it is for another week. Business in the Gas Market has very much resembled that of the preceding week, being much restricted, though the general firmness is still very marked. Changes in quotation are few in number, and moderate in degree; but they are all in the upward direction. Gaslight issues have again had the lion's share of what business was doing. The "A" was done steadily at about the old figures of the week before; the best price being 227, which is fractionally higher. The secured issues were again in excellent demand, and changed hands at advanced rates; the quotations of the 10 per cent. preference and of the 4 per cent limited showing a rise. South Metropolitans continued only a degree removed from absolute stagnation; two transactions being the sum total of the week. Commercials were quite unnoticed and unchanged. The Suburban and Provincial Companies provided no incident calling for any remark; and none of them made any move. The Continentals were more active, especially Imperial and Union. The former was very firm; while both issues of the latter scored an advance. Of the rest the only one to make any sign was Melbourne, which recovered a point. The Water Companies continued very quiet again, and prices underwent no variation.

The daily operations were: Gas opened very quiet on Monday, and remained almost inanimate—nothing moving. Tuesday's business was slightly brisker, and prices were good; but still there was no advance. Wednesday was better, with a more decided tendency upward. All Gaslights were very firm; while Continental Union improved 2; and ditto preference, 1. Thursday's transactions were fewer; but the tide was still rising—Gaslight "B" gaining 1½; and ditto "C," "D," and "E," 1. Melbourne also improved 1. Business was again brisk on the following day; and all issues dealt in showed great firmness. Gaslight "J" advanced 1.

ELECTRIC LIGHTING MEMORANDA.

An English Criticism of Electrical Exhibits at Chicago—Charles's Law and Gas Bills—What is to be done with Unprofitable Electric Lighting Stations?

A BRITISH exhibitor of the electrical engineering order having returned from the Chicago Exhibition has been duly interviewed by a contemporary, and prevailed upon to give expression to his impressions of the big show. We have waited with some curiosity for a statement of this kind, because the last Electrical Exhibition held in England was so lacking in objects of novelty that it was natural to wonder whether the Chicago collection of electrical apparatus would show any improvement in this respect. The reporter in question is Mr. Hugo Hirst, of the General Electric Company, Limited, of London and Manchester, whose competence to pass judgment upon matters connected with the electrical trade, whether in America or elsewhere, should be sufficiently obvious. This gentleman told his interviewer that he found the Chicago show disappointing in many respects. His dissatisfaction was largely with the administrative arrangements, which are such as to seriously interfere with the comfort of visitors to the Exhibition; and for the rest, he found little new in the industrial and manufacturing exhibits. Up to a certain point—the laying out of the grounds, the planning and erection of the buildings, and the filling of them with innumerable exhibits—the administration of the enterprise did wonderfully well, as Mr. Hirst admits, in agreement with everybody else. It is the lack of finish, and the disregard of the many little details that make for the interest of exhibitors and the convenience of the public, that Mr. Hirst complains of—in which, again, he is not singular. As to the purely electrical aspect of the show, Mr. Hirst has little to say

that is good. He thought the electrical exhibits behind those of other branches of industry, which he accounts for by the circumstance that this part of the show is almost monopolized by two or three large firms, whose exhibits are stale. These firms have committed themselves to the economical, but fossilizing policy of standardizing their productions, and consequently cannot go in for anything new. Quantity instead of quality is their aim, with the usual result. There are few Continental electrical firms exhibiting at Chicago; and these again have no novelties on offer.

Our electrical friends have paid more attention than it is worth to a recent statement appearing in *Industries and Iron* respecting the effect of the hot weather of the present year upon the gas passing through consumers' meters. It was put forward in this publication that, since the abnormally high atmospheric temperature must have expanded the gas before it reached the point of measurement, consumers must have been charged for more than they really received—the lighting and fuel value of coal gas being functions of its mass, and not of its bulk. We did not think it worth while to take any notice of this bit of pedantry; but the *Electrician* has fastened upon it as a peg for an advertisement of the superior stability of electricity, which, as is truly remarked, never indulges in "vagaries of this sort. A Board of Trade unit never expands." But supplies of electricity have plenty of other "vagaries" to answer for; and we are quite content to leave the sin of expansion to be manifested by the consumers' bills. With regard to the effect of variations of atmospheric temperature upon gas supply, however, the idea that the consumer is liable to be wronged by any such natural phenomenon is a "mare's nest." The gas is stored in bulk over water, and is distributed through mains and services buried deep in the earth, so that its summer and winter temperature vary but little at the consumers' meters. And what variation there is from this cause is in favour of the consumer; for, whereas the standard of "mass" of coal gas is that which appertains to a temperature of 60° Fahr., which is very near the actual during more than one-half of the year, if the gas should be expanded by a rise of temperature of a few degrees during some of the hottest weeks of summer time, it is then that the consumption is at its lowest, while should the gas be condensed by a few degrees of cold, thus causing more of its "mass" to be passed through the consumers' meters than is registered, this is just when the consumption is heaviest. Hence, notwithstanding anything that the *Electrician* may think, consumers would have no cause for gratitude to anybody who should "design a gas-meter with an absolute thermo-dynamic compensator."

The *Electrical Review* is anxious for the future of not a few central electric lighting stations, some of which it admits are bound to result in dead loss to the proprietors. This circumstance is conceded to be a natural consequence of the increase in the number of such enterprises. Our contemporary is fearful of being charged with pessimism—dreadful word—for even suggesting such a possibility as that of any electric lighting station failing to pay its way, but declares that even now it would not be necessary to seek far for a central station the managers of which are "struggling almost hopelessly to improve their revenue." In the United States, enterprising managers of unprofitable electric lighting stations, with the fear of the sheriff's officer before their eyes, have been known to pick up a little additional revenue by going in for steam heating in winter, and doing a little in the way of ice manufacture and cold storeage in summer. Such devices are not for British electricians, even if they were worth anything, which is doubtful. Notwithstanding its solicitude on their behalf, our contemporary is unable to advise the managers of British electric lighting undertakings actually or potentially unprofitable—if the phrase is permissible—how to improve their position. It counsels attention to the purely steam-producing and auxiliary plant, instead of endeavours to increase the efficiency of the electrical machinery "probably at a heavy price." But this is merely the parental advice to "be a good boy" imparted to a youngster going to school, with all his troubles before him. On such occasions general advice, however good it may be, seems to lack point; and the victim feels that he would prefer a few hints on matters of detail.

Mr. Herbert Buckland, who has for a number of years been in the service of the Leeds Corporation Gas Committee, has been appointed Assistant Gas Engineer at the Portsmouth Gas-Works—a position advertised in the JOURNAL last June.

Death of Mr. Layard Jones.—News reached England last week of the very sudden death, on Sunday, the 27th ult., of Mr. H. M. Layard Jones, for the last eight years Engineer and Manager of the Papolo station of the Anglo-Romano Gas Company, at Rome, and formerly in the same capacity for nine years at the Oporto Gas-Works. This sad event makes a further gap in a family whose life-long connection has been with gas-works construction and management. Mr. Layard Jones's father (Mr. Hodgson Jones), it may be remembered, died as recently as last December. There are, however, two brothers still surviving—Mr. Walter R. Jones, of the Via dei Cerchi Gas-Works, Rome, and Mr. Charles Jones, of the Milan Gas-Works. The deceased gentleman was one of the few life members of The Gas Institute.

MR. SAM. WOODS, M.P., ON THE COAL WAR.

WHEN the wise man of old desired, in his troubles, that his enemy should "write a book," he formulated in a happy phrase one of those impulses of perplexed human nature that arise independently of change of times and alteration of circumstance. Now, as ever, when men find themselves divided in opinion, it is the wish of both sides to have the views of their opponents set down in a clear and definite manner, in order that these may be examined, judged, and if possible refuted. There are many facilities for this in the present age; and it is no longer necessary to wait for the publication of a book to ascertain the points of any controversy that may happen to engage public attention. One or other of the numerous reviews that register the thought of the hour, can always be depended upon for information respecting the polemic of the season; and so, with regard to the so-called "coal war" now devastating the Midlands, the position of one of the combatant parties—the members and Executive of the Miners' Federation—is to be ascertained from an article contributed by Mr. Sam. Woods, M.P., to the current number of the *New Review*. We shall not be blamed for taking Mr. Woods as the official spokesman of the Miners' Federation; and it is worth while to follow his declarations of the policy of this organization, because he does as a matter of fact formulate certain definite conclusions as to the principles by which the output of coal is to be controlled in the future, with a view—first to the strengthening of the position of the miners; and, secondly, to the prevention of such interruptions of trade as that the country is now suffering from.

Mr. Woods begins by claiming for the Miners' Federation the position of being "probably the largest numerically, as well as the most powerful, trade organization in the world." The former claim may be justified by facts, as to which we have nothing to say. As to the latter, before the pretension to the supreme power can be allowed, one must inquire in what this power consists. Is it the power of numbers acting under a single directing head, or the power of the purse? If the power of a trade organization means the number of votes it can collect by direction of the Executive, it is clear that the value of this show of strength depends wholly upon the extent to which counsels so supported can be maintained by the "sinews of war." Unless the exchequer of a trade organization can preserve a due proportion of resources to the calls that may be made upon it, numbers in the membership are a weakness rather than a source of strength. This is precisely the question with the Miners' Federation at the present crisis; but upon this point Mr. Woods is prudently silent. He admits that the Federation is "commonly associated with what is erroneously called the New Unionism," because—and here we have yet another attempt to define what constitutes this variety of Trades Unionism—"its policy is of a progressive character, and its *modus operandi* is to discard the old weapons of industrial warfare, such as arbitration (as generally understood) and sliding scales, which have been weighed in the balances of experience for the lengthened period of twenty years, and found wanting, and depend for existence on its own vital force in maintaining, under the most adverse circumstances, a living minimum wage for its members."

Here we have several propositions that might well be discussed at greater length than we can afford space for. The last sentence is as sublimely vague as anything penned for an electoral address by the most nebulous politician. How a minimum living wage is to be determined, and how it is to be maintained, are alike left unsaid; but the critic may look to the present strike for an illustration of Mr. Woods' unexpressed meaning. He appears, moreover, to pin the existence of the Federation to its prospects of coming triumphantly out of this trial. But he does not really mean so much; for if the present strike should fail, and the men are driven to accept the masters' terms, the Executive of the Federation may be depended upon to construct a "golden bridge" somehow, over which they can retreat for the purpose of saving their organization. It is easy to call any policy "progressive," which is a question-begging term; and one might pertinently inquire where the progress comes into the determination to have nothing to do with arbitration or sliding-scales as agencies for settling wages disputes, since these devices are of later origin than mere striking and locking-out for the attainment of the same object. It might also be asked how sliding-scales have failed, when an arrangement of this kind has enabled the Welsh colliers to live in peace for twenty years, and continues to command the acquiescence of the majority of the workers to whom it applies.

To proceed, however, with Mr. Woods' article. He claims for the Federation that, from its formation in 1888, it has succeeded in forcing from the mine-owners successive increases of wages, which, he says, caused the employers to raise the price of coal to the public by much more than a corresponding figure. The latter circumstance is brought forward by way of justifying the pressure exercised by the Federation. It is admitted that, after wages had been increased in this way by 30 per cent. upon the standard of 1887, a fourth demand in 1890 for a rise of 10 per cent. was resisted by the employers, who offered to open their books to show that the increase was not warranted by the selling prices of coal. The miners, however, declined to have

anything to do with the employers' books; being confident, from their own knowledge, as they said, that prices would more than justify their demand. Yet eventually a compromise was accepted, which Mr. Woods describes as "satisfactory to all concerned." Since this period, according to Mr. Woods, there has been no change in wages *or in prices*, "except what has resulted from the baleful system of underselling among coal-owners, caused mainly by the unfaithfulness of one employer to another." The italics in the above passage are ours; and the statement, it is hardly necessary to remark, is grotesquely untrue, as gas manufacturers well know. Mr. Woods confesses as much in his next words, in which he reflects upon the under-selling tactics of the coal-owners. These are pure figments of the Trades Unionist imagination. There is evidently no consciousness in Mr. Woods' mind of the existence of a market for coal as of all other commodities. He blames the coal-owners for not maintaining the product at the high values reached (as he thinks by their own action) in 1890, unsuspecting the fallacy upon which the accusation rests, and which tends to vitiate his whole case against the employers.

The article tells the tale of the conference at the Westminster Palace Hotel on June 30 of the present year, when Mr. A. M. Chambers laid before the representatives of the Miners' Federation the extent to which the correspondence between coal prices and wages had failed since the latter were fixed in 1890. He, however, omits to state that at the same time Mr. Chambers, in the name of the Associated Coal-Owners, offered to submit the whole matter to arbitration, although the circumstance is allowed to crop out incidentally afterwards. The further progress of the negotiations, and the result, are told fairly enough. It is to be gathered, however, from the writer's bitter reflections upon the conduct of the Durham and Northumberland men, and his appeals for public sympathy and support for the Midland men, that, for all their boasting, the Federation entered upon the struggle against the employers with but small funds; and it becomes a question what the managers of the organization have been about during the last five years of prosperity that they should be short of money in their hour of need.

Mr. Woods attempts to show that the statement of the coal-owners respecting the reduced prices of their product is untrue. He comes to speedy grief, however, over the knotty point of railway and gas contracts, which he practically gives up, declaring that in these cases "the price is fixed by the purchaser, and not by those who sell the coal." How this assertion is to be reconciled with the writer's own admission that from 1888 to 1890 the coal-owners continued to put up prices, and his assumption that the same parties could have maintained the maximum prices if they had chosen, is a natural question that we cannot offer to answer.

Coming to the main point of how wages in the coal trade should be regulated, Mr. Woods roundly denounces arbitrations. Why? Simply because "they have not given satisfaction to either one party or the other"—which, most people would think, goes to prove that the system must be worth something, if only as a means of splitting differences. Mr. Woods declares that "conciliation, and not arbitration is the only means of settling disputes between capital and labour; and when this fails, there is nothing left but the stern arbitrament of war." This is mere hollow verbiage. In Mr. Woods' mouth the word "conciliation" obviously means nothing more than a sort of machinery for facilitating meetings between the coal-owners and the Union leaders, at which the latter are to have all their own way; the only alternative being a strike. The truly remarkable comment upon this irreconcileable attitude of the Federation leader is the inability of the organization to provide itself with a respectable war-chest.

Mr. Woods is able to formulate several "lessons" likely to be learnt by the miners of the Federation from their present experiences, for indicating the way to victory upon a future occasion, if (as is tacitly granted) the existing strike should turn out a failure. The first is that "no stacks shall be placed on the pit-banks under any pretence whatsoever," because these constitute the principal weapon in the hands of the employer. This piece of counsel is significant of much. The miner has less reason to dread the "blackleg" than the member of any other Trade Union; but he now learns that this circumstance is not sufficient protection for his rear when he elects to go upon the war-path. But the advice is futile; for if the miner were never to raise a truck load of coal to be stacked at the pit's mouth, he could not prevent gas and railway companies from storing as much as they think necessary. Next, Mr. Woods asks buyers of coal to disallow strike clauses in coal contracts, which is mere "crying for the moon." He proceeds to remark that the question of Government control for collieries will soon enter into practical politics, if the coal-owners do not mind what they are about—which is an observation that cuts both ways—and he concludes that "if these stoppages are intended by the coal-owners to be rushed on the country periodically, merely to gratify their own selfish ends, then the miners will most certainly learn the necessity of accumulating a larger fund than ever, and on national lines." There would not, of course, be anything at all "selfish" about this arrangement! Mr. Woods is probably correct in believing that good will come out of the present struggle, whatever may be its issue. "It will make the miners wise men." Let us hope so; and that, among other things, it will teach them, when they form a Union for nothing else but fighting, to see that the money is better looked after than seems to be the case in the present organization. Mr. Woods affects to think that "it will show the greedy selfishness of many of the coal-owners in its true colours; it will give an impetus to the Socialistic movement in the country; and it will strike a powerful blow at the undue influence possessed by capitalism and landlordism." Thus speaks the mass-meeting orator, who so long as he can use plenty of sounding words, cares little for the sense or the relevance of his statements. Hard words break no bones; and Mr. Chambers can afford to smile at Federation rhetoric while the inexorable logic of events is proving which party in the Coal War has the stronger position.

THE UTILIZATION OF ENERGY.

(*Concluded from p.* 444.)

RESUMING consideration of the subject opened up last week, Professor Kennedy asks: How, then, do these working fluids stand in regard to the problem of economy? It has, first, to be recognized that the mere nature of none of them gives it any advantage whatever. The fact that steam can be liquefied in a condenser after it has done its work, is a great convenience to us; but this does not make the steam a better working fluid than air, which cannot be so liquefied. Gas is the best, because its highest temperature is that of combustion, and is available on the spot. Coal gas is almost pure heat, in the thermo-dynamic sense; its efficiency rising as high as 80 per cent. Air comes next, being 55 per cent. Steam stands at 30 per cent.; and ammonia is at the bottom of the scale, with a bare 15 per cent. of theoretical efficiency. From this statement it may be gathered that with gas-engines the theoretical efficiency is already so high that it is not necessary to trouble about raising it. With gas, in fact, and to a smaller extent with air, the possibility of improvement lies in bringing the actual up to the theoretical process—that is to say, the problem is a mechanical one. With steam it is different. Here we want to raise the theoretical limit of efficiency; but the material is one which is liquid at ordinary temperatures and pressures, so that in its working condition it is a vapour and not a gas, and its temperature cannot be raised without at the same time raising the pressure. Considerations as to the strength of engine materials here come into force. But even if these were left out of account altogether, and the maximum working pressure of steam-engines were to be raised from its present limit of ten atmospheres to twenty atmospheres (that is, by 100 per cent.), the theoretical maximum efficiency would be increased only about 10 per cent.—a quantity hardly worth talking about. It is not in this direction, but in that of superheating the steam after it is formed, that Professor Kennedy looks for the improvement of the steam-engine in the near future. He dismisses as impracticable the idea of improving the steam-engine at the lower end of the scale, by the use of ether or ammonia. He thinks, however, that the mechanical efficiency of the steam cylinder may be improved by checking the loss due to condensation, working along the lines laid down by Willans, Cotterill, and Donkin. At present, there are at work thousands of steam-engines in which, for every ton of water that has been evaporated in the boiler, half a ton does no good whatever, except to warm up (by being itself condensed) the engine sufficiently to allow the other half ton to do some work.

Turning to gas-engines, Professor Kennedy declares that the future of this class of motors has great possibilities. Up to a certain point, their progress was surprisingly rapid; at present it has almost stood still for some years. Just now, however, there are signs that the manufacturers of these engines are trying to move forward a little, so as to make larger and faster running engines, and, in short, to make an effort to get on all-fours with the steam-engine. Professor Kennedy discusses the performance and possibilities of the ordinary gas-engine; showing that, of its possible theoretical maximum efficiency of 80 per cent., only from 22 to 32 per cent. is realized. Of the waste, the greatest portion is due to the water-jacket. As the lecturer says, the modern gas-engine aims at securing incompatible results. To reach the high efficiency, the initial temperature is made very high; but since this, if left alone, would melt the material of which the machine is made, we have to adopt the somewhat barbarous expedient of continually keeping the metal cool by means of a water-jacket. Though, therefore, the theoretical maximum efficiency is so much greater than that of a steam-engine, the actual efficiency is not nearly so great. Notwithstanding this, the actual energy utilized per thermal unit of combustion is very considerably greater in a gas-engine than in a steam-engine.

Undoubtedly, remarks Professor Kennedy, very great possibilities for increased economies exist here. The appearance of a new type of gas-engine which should use only one-half the gas per horse power per hour which present engines require, would doubtless be received with scepticism; but Professor Kennedy is quite prepared to hope that such a motor may make its first appearance presently. It is not at all so easy as in the case of the steam-engine to suggest the direction in which to work for increased economy. "Paradoxical as it may seem, it is not improbable that a reduction of the initial

temperature might here be attended with economy. There is no doubt some one temperature at which the loss and gain just mentioned would adjust themselves most advantageously. A solution of the whole matter—a solution which would also greatly help the steam-engine problem—would be the discovery of some non-conducting material which is at the same time suitable for use in the construction of engines. . . . Something as strong as iron and as easily machined, with the conductivity of sawdust, is what we want—a material which at the same time must remain sensibly unaffected by excessively high temperatures, and which will stand rubbing to any extent."

Professor Kennedy devoted the closing portion of his lecture to the discussion of the possibilities of economy in connection with the generation and distribution of electricity, and the development of light. He had prepared a diagram which plainly showed "the gradual degenerative process by which the chemical energy of combustion is converted into electric light—beginning with the boiler and ending with the lamp. The result, as the lecturer said, is so insignificant as to savour a little of the ridiculous. The most efficient link in the chain is the dynamos, which give out as electrical work something like 92 per cent. of the mechanical energy received from the steam or the gas engine. It is in the last link of all—the lamp—that the inefficiency not only becomes most conspicuous, but also cries loudest for remedy. At present, in order to obtain light, electricians have to pass a current through a carbon filament until it becomes white hot; and it is only after this amount of work has been done upon it that the filament shows a light at all, by which time 95 per cent. of the total energy supplied to the lamp has been spent as heat, and to this extent wasted. To obtain light without heat, or with a minimum of heat—that is the point; but Professor Kennedy proclaimed his inability to tell where this *desideratum* is to come from. He referred to Mr. Tesla's remarkable lecture at the Royal Institution, and the sanguine declarations made by certain newspaper writers next day—"possibly misled by some pardonably incautious enthusiasm on the part of the lecturer"—that at last the hour had come. "Electric light was to roam the universe at large; and you only had to put a tin plate on the ceiling and hold a lamp in your hand, for the whole room to be lit up!" Perhaps, as Professor Kennedy quietly observed, the newspapers would not have been so sanguine if they had known that the gas-engine which lights the whole Royal Institution buildings easily was hard put to supply energy for Tesla's experiments, the most striking and beautiful of which scarcely did more than render the lecturer visible in the dark. "It would be sanguine to hope that the light of the future will be economically worked out on those lines." This is the first time the information on this head has been made public; but Professor Kennedy's point must not be forgotten whenever these brilliant high-frequency manifestations are in question.

Our old friend the glow-worm came in for his due share of mention by the lecturer. Whereas the preacher of thrift in old time exhorted his hearers to "go to the ant" for a pattern of industry, the modern physicist tells the engineer to look at the fire-fly and the glow-worm for examples of the most economical kind of lighting known. Professor Kennedy puts in a pertinent reminder of the very disappointing character of the glow-worm, whose light is so clear that from a distance of a few yards he appears to be really bright, "but when you examine him from the point of view of looking for *light*, you find there is a terribly small amount to look for—a candle would be a conflagration in comparison." All the same, the objection that weighs on Tesla's experiments does not apply to a glow-worm. If his light is small, it does at any rate render its bearer distinctly visible, and certainly does not involve the driving of a gas-engine at its utmost capacity!

After recapitulating the divisions of his address, and passing in review the different directions in which the possibilities of economies in the transformation of energy present themselves, Professor Kennedy argues that it is the number of these existing leaks that tell upon such a matter as incandescent electric lighting; and he asks whether some of these cannot be done away with altogether. If an ordinary gas-engine is substituted for a steam-engine, the factor of boiler efficiency is cut out, or rather the corresponding losses are left to the gas-works. Whether it is more economical that these should occur there or in a boiler, depends upon the price and quality of gas. At the same time, the higher efficiency of the gas-engine is substituted for the lower efficiency of the steam-engine, which may be a very important matter. Still more fascinating are the ideas of obtaining electrical energy direct from steam-jets, and so doing away with the engine at least; or else consuming carbon in enormous primary batteries, instead of burning it in furnaces, and so at one stroke clearing off boilers, engines, and dynamos. "One wishes in vain that one could see ground for any kind of reasonable hope that such methods would be practicable!"

Professor Kennedy comments very briefly upon the possibility of substituting not merely a gas-engine for a steam-engine, but at the same time also a gas-producer for a boiler; so that the motor fluid should be producer gas made on the premises, and neither steam, nor coal gas from the town mains. He is of opinion that such a combination, although it does not much reduce the number of transformations, gives, under certain conditions, a very high fuel economy. He does not, however, think that the existing evidence is sufficient, although he hopes it shortly will be, to prove how far, under ordinary working conditions, the actual combined efficiency of the whole plant will surpass that of older systems. The theoretical maximum efficiency is admittedly much higher.

Yet one more matter is dealt with in this most comprehensive lecture—the possibilities of utilizing dustbin refuse as fuel. Of course, Professor Kennedy admits that this stuff has the great recommendation of costing nothing; and all the heat due to its combustion is at present thrown away. He says, however, that he "cannot help fearing that, like most things that cost nothing, this will be found to be worth very little more than it costs." He says that he schemed some time ago the boilers at a station (electric light) in the North of England, to try the experiment of using waste gases from a town's destructor; but he has not been sanguine enough to hope to do more in this way than save some of the cost of banking fires, or running at a very low load. "In any case, it has to be remembered that the dust destructor works on uniformly day and night, delivering a uniform amount of heat; while the boilers of a lighting station want heat non-continuously in the most variable fashion. If, therefore, more than a very small fraction of the destructor heat is to be utilized, arrangements, must be made for storing that heat somehow, so that it can be drawn upon as it is wanted. With thermal storeage there is at least a theoretical possibility of using most of the destructor's heat; without storeage, 10 per cent. of it is probably the largest amount that can possibly be utilized."

Thus, to sum up the whole matter in the way of possibilities and impossibilities, there does not appear to be anything very startling before us in the way of possible economies, except in the two directions of efficiency of lamps as light-producers and of bringing up gas-engines to their theoretical maximum. The latter prospect contains quite as much hope for the gas industry as for that of electric lighting, and perhaps a good deal more. Meanwhile, "for those of us who are not born to be inventive geniuses, there is always the consoling thought that the difference between good engineering and bad engineering in economy, with the very same materials, is very much greater than the difference between good engineering and any probable improvements upon it." Thus once more is taught the old lesson that to do the nearest and plainest duty well is enough for most men in this work-a-day world.

NOTES.

Liquid Firing at Chicago.

Sufficient attention has hardly been paid by engineers to the circumstance that the immense amount of steam required for driving the machinery at the Chicago Exhibition is all generated by liquid fuel and water-tube boilers. Very little structural alteration has been found necessary in order to adapt these boilers to burn the liquid fuel. Instead of the usual furnace-door, the combustion chamber is closed in front by a plate having a hole through which the fuel injector enters; and the place of the fire-bars is taken by a course of perforated refractory bricks. The fuel-jet is so arranged that it strikes against a perforated vertical brick screen of somewhat similar construction, which occupies the place of the ordinary bridge. The fuel used is crude petroleum, distributed to the boilers by means of a system of pipes, one of which rises up from the floor in front of every furnace, where it is met by a descending steam-pipe; and the two unite to form the simple injector, or atomizer, already mentioned. The flow of oil or steam may be regulated by means of screw-valves, and the delivery of the atomizer may also be controlled by a needle with a screw attachment. These oil-fires are quite smokeless and very efficient; the evaporating duty of the oil being about 15 lbs. of water per pound. The store of oil is at a distance of hal a mile from the range of boilers; and the oil is distributedfby pumps working against a pressure of about 6 lbs. per square inch—the fire-underwriters not sanctioning gravitation distribution, nor any higher pressure in the oil mains. Eight different patterns of boilers are in operation, and more than as many different makes of oil-burners; but there does not appear to be any marked discrepancy between their performances.

The Treatment of Drinking Water by Coke and Alum.

Writing with reference to the threatened appearance of cholera in England, and the lowness of the available stock of water, which must have resulted in the concentration of whatever impurities the usual sources of supply may contain, the *Lancet* cites Dr. Percy Frankland as stating that well carbonized gas coke is one of the best filtering materials that can be used. It is a fortunate circumstance that this filtering medium is to be had at a low price everywhere; and it has the advantage of being as good as ever for fuel after it is no longer serviceable for purifying water. In country places, where the water of shallow brooks and springs is the only available supply, an excellent filter may be made out of a cask with a false bottom, filled with layers of respectively fine, medium, and coarse pieces of coke—the last on the top. If the water is in need of additional purification, this may be done by the addition of a small proportion of alum—2 or 3 grains to the gallon will suffice—to the water before it enters the coke filter. This will precipitate

all suspended matter, and almost completely reduce the number of micro-organisms present.

The Volatilization of Metals and Earths.

Working with his electric furnace, M. Moissan has been able recently to obtain some remarkable results in connection with the volatilization of a number of substances usually known only in the solid form. Thus, when a small piece of metallic copper was placed in the furnace and subjected to the arc furnished by a current of 350 ampères, brilliant flames shot forth from the apertures through which the carbon terminals were inserted. These were due to the combustion of copper vapour in the oxygen of the air, and were accompanied with copious yellow fumes, some of which condensed into globules of pure copper. It has long been known that silver is volatile. It is now found that, at the temperature of the carbon arc, silver boils in a few moments, and may be distilled with ease —condensing in the form of globules. Platinum fuses in a few moments; and very soon after it commences to volatilize, and can be condensed in brilliant little spheres and fine dust. Aluminium distils very readily, and condenses in the form of a grey powder containing spherules exhibiting brilliant metallic lustre. Tin likewise distils with facility; and the condensed product usually contains a considerable proportion of a curious fibrous variety of the metal. The distillation of gold is particularly interesting. It is not the metals only that are capable of volatilization at the temperature of the carbon arc. Carbon becomes almost immediately converted into graphite, which distils over into the condenser, and deposits in the form of light semi-transparent plates, which by transmitted light exhibit a beautiful chestnut colour. Distilled carbon would thus appear to consist of the fourth variety of the element, recently alluded to by M. Berthelot. M. Moissan has succeeded in distilling lime, silica, and magnesia; the latter exhibiting a particularly brilliant incandescent vapour. These experiments may be collated with those of Professor Dewar at the other end of the scale of temperature, as showing that the forms of the elements as we know them are strictly due to the temperature to which they are exposed.

COMMUNICATED ARTICLE.

COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

A Series of Articles for Gas Students.

CONCLUDING ARTICLE.—CONSUMPTION.

The subject of the present article is a very comprehensive one. It embraces the design and construction of various types of gas-utilizing appliances for illuminating, heating, and for general trade purposes; also pressure-regulators, globes, shades, fittings, and other appendages designed to aid in the economical development of the highest available duty of the gas; and—as essential to a thorough apprehension of the principles which should underlie the construction of the foregoing—a careful study of the average composition of ordinary illuminating gas, of the characteristic properties of its principal constituents, of the structure of flame, and of the conditions necessary to the perfect combustion of the gas. It will, therefore, be more convenient to divide the article into sections, and to discuss the various subjects enumerated under the following heads: Composition of ordinary coal gas, and the structure of flame; conditions favourable to perfect combustion and the development of the highest available duty, and the application of same to burner construction; various types of gas-burners, illuminating and otherwise; pressure-regulators, fittings, &c.

I. *Composition of Ordinary Coal Gas, and the Structure of Flame.*

The student is by now fairly familiar with the principal constituents of ordinary illuminating gas, and their normal effect on its luminiferous value; but he must remember that the approximate percentage composition is not always a safe indication of the capabilities of a gas. On the contrary, the degree of permanency of some of the light-giving hydrocarbons is largely affected by certain circumstances attendant upon the manufacture of the gas—such as the temperature of distillation, the duration of the period of carbonization, the *methods of enriching* (if any), and also upon the condensing arrangements, and other variable conditions which may or may not be beyond control. The recently-introduced methods of enriching coal gas with rich oil gases, has much intensified this difficulty; and herein probably lies the principal explanation of that marked diversity in photometrical results which has repeatedly been observed when testing gas from the same works, and presumably of fairly constant composition. Another even more frequent phenomenon is an actual variation in the composition of the gas itself when produced from the same class of coal, and presumably under precisely similar working conditions. A little neglect on the part of the stokers—either by delaying a "draw" somewhat, and thus leaving a charge too long in the retort, or through charging "light" to similarly cause a charge to remain after being thoroughly spent—is apt to alter the constitution of the gas very materially, by splitting up certain hydrocarbons, with the formation of others of a different nature. Similar variations may attend undue heating of a bed, over-charging and all or any of the thousand-and-one errors of judgement incident to the workings of the retort-house. Rapid, inefficient, or excessive condensation is also likely to produce undesirable complications of a like nature—as already pointed out.*

Curiously enough, these variations are not *necessarily* attended by corresponding alterations in the illuminating power, although the gas when under test will probably require slightly different conditions of pressure and air supply. It has also been noted that various samples of gas taken from bulk, will not, under precisely similar conditions, always give exactly the same photometric results. In a previous article,† will be found the percentage composition of a sample of London gas analyzed by Professor Vivian B. Lewes, as also tables of the principal constituents of ordinary coal gas and their light-giving values. The following is another analysis by the same authority:—

	Per cent.
Hydrogen	51·6
Marsh gas	36·7
Illuminants	5·8
Carbonic oxide	5·1
Carbon dioxide	0·0
Nitrogen	0·6
Oxygen	0·2
	100·00

The following analysis of London cannel gas is from the "Chemistry of Illuminating Gas," which every student of gas matters should carefully study:—

	Per Cent.
Hydrogen	29·7
Marsh gas	50·0
Illuminants	13·0
Carbonic oxide	6·8
Carbon dioxide	0·1
Nitrogen	0·4
Oxygen	
	100·0
Water vapour	2·0

Taking an average sample of coal gas, it will be found to consist, roughly, of 50 per cent. (or one-half by volume) of hydrogen gas, 35 per cent, (or over one-third) of marsh gas, and about 5 per cent. (or one-twentieth) of carbonic oxide, all three of which are practically non-illuminating (although the marsh gas, under circumstances already noted, may indirectly assist in the production of light). The luminosity of the gas is therefore derived solely from some 5·5 to 6 per cent. of illuminating hydrocarbons—ethylene, acetylene, benzene, &c.—which are thus diluted in the bulk of the gas by some 93 per cent. of non-illuminants. Of these diluents, the three first named play an important part in the combustion of the gas, and (indirectly) in the development of light from the illuminating series of hydrocarbons. The nitrogen takes no part in the combustion, and tends to cool the flame and lower its luminosity. To a certain extent, the presence of oxygen is favourable to the development of light.

Hydrogen is well known to the student. It is of the lightest specific gravity of any gas (hence it is taken as unity), burns with a blue flame of intense heat—the product being water vapour. Marsh gas (light carburtted hydrogen CH_4) burns in excess of air with a bluish-yellow non-luminous flame, producing simply carbon dioxide and water; but when burnt with a limited supply of air, it yields several products, amongst which is acetylene, C_2H_2. The peculiar smell which attends the incomplete combustion of coal gas, as when "lighted back" at he jet of a Bunsen burner, is due to the formation of acetylene. Carbonic oxide burns with a blue flame of very intense heat—the product being carbon dioxide. This latter gas, passing through the incandescent carbon (noted later on), takes up another atom of carbon, thus again being converted into carbon monoxide, which is once more oxidized, with the formation of carbonic acid. The ignition-point of hydrogen gas is comparatively low—a dull red heat being sufficient to fire it. That of marsh gas is, on the contrary, very high; while carbonic oxide also ignites at a low temperature, slightly above that of hydrogen. Hence, when (say) a lighted taper is presented to a stream of gas issuing from an ordinary burner, the heat of the taper-light at once ignites the hydrogen of the gas, and also the carbonic oxide. The heat attending the combustion of these two gases is sufficient to decompose the hydrocarbons into their elements—hydrogen and carbon. The former, having greater affinity for oxygen than the latter, is readily oxidized—intense heat being thereby generated. The heat thus produced by the combustion of the hydrogen—both that originally free and also that just liberated—is sufficient to raise the particles of carbon (which have been liberated in the solid state, by the aforesaid decomposition of the hydrocarbons) into incandescence, in which condition they continue until, passing through the flame, they approach the outer zone of combustion, where meeting with an excess of oxygen they are converted into carbonic acid. This will be more apparent as we consider what is the structure of an ordinary gas-flame.

A gas-flame is either luminous or non-luminous. In either case we have present what may be termed three distinct zones, or areas of combustion. First, there is nearest the burner and to

* See JOURNAL, Vol. LIX., p. 1041. † *Ibid*, Vol. LXI., p. 1041.

a little distance from it, a dark central zone of unburnt gas, which is, however, enclosed within an envelope of the non-luminous blue flame of burning hydrogen, and possibly of carbonic oxide also. This zone of unburnt gas is attributable to the absence of heat at this point of the flame—due primarily to the cooling effect on the flame of the gas as it issues from the burner tip, as well as to abstraction of heat by the burner itself. The presence of this unburnt gas, as also of the non-luminous flame, may be proved (1) by inserting an open tube into the flame at this point, when the gas will pass along it from the centre of the zone, and may be ignited at the far end; and (2) by placing a platinum wire through this portion of the flame.

Next comes the luminous zone, or area of incomplete combustion—the latter condition being due to the limited supply of air which necessarily obtains at this point. This zone, or belt, is also opaque (being itself capable of casting a shadow), which is indicative of the presence of solid matter. The origin of the latter has already been explained, and is due to the decomposition, by the heat of the burning hydrogen, of the hydrocarbons into their constituent elements, carbon and hydrogen. The gaseous hydrogen burns directly. The solid particles of carbon—the presence of which may be readily ascertained by inserting a cool surface into this part of the flame, which surface is immediately blackened by particles of soot or pure carbon—are raised to incandescence by the intense heat, and impart to this zone its characteristic intense luminosity. In the Bunsen flame, this middle zone is non-luminous, the reason for which is explained in a succeeding paragraph.

Outside all is the non-luminous zone, or area of so-called complete combustion. With the luminous flame, this zone is practically invisible; but it is readily discernible in the Bunsen flame. It is largely due to the combustion of carbonic oxide gas. The supply of air to the middle zone being but limited, the oxidation of the carbon is incomplete, and carbonic oxide (CO), as well as carbonic acid (CO_2), is largely produced; whilst in the outer zone of unlimited oxidation, the bulk of the former is converted into the latter.

Professor Lewes suggests, however, that even here combustion is not perfect.* He says: "It is a zone in which luminosity is destroyed in exactly the same way that it is destroyed in the Bunsen burner—*i.e.*, the air penetrating the flame so dilutes and cools down the outer layer of incandescent gas, that it is rendered nonluminous; while some of the gas sinks below the point at which it is capable of burning, with the result that considerable quantities of the products of incomplete combustion (carbon monoxide and acetylene) escape into the air, and render it actively injurious." The Professor's remarks are supported by an examination of certain gases which, escaping from this outer zone, had been carefully withdrawn by aspiration and analyzed, with the following results:—

Gases Escaping from the Outer Zone of Flame.

	Luminous.		Bunsen.
Nitrogen	76·612	..	80·242
Water vapour	14·702	..	13·345
Carbon dioxide	2·201	..	4·966
Carbon monoxide	1·189	..	0·006
Oxygen	2·300	..	1·430
Marsh gas	0·572	..	0·003
Hydrogen	2·388	..	0·008
Acetylene	0·036		—
	100·000		100·000

Another very interesting table as illustrative of the order of combustion of the various constituents of coal gas, and based on the experiments of Landolt upon a rich coal-gas flame, is the following† :—

Composition of Gas in Flames at Varying Heights from the Burner.

Composition of Gas in Flame.	Height from Burner in Inches.					
	0	0·39	0·79	1·18	1·58	1·97
Hydrogen	22·66	14·95	15·49	15·54	14·50	11·95
Marsh gas	33·77	30·20	28·34	21·55	11·92	3·64
Carbon monoxide	7·34	14·07	14·05	14·58	22·24	25·14
Olefines	7·29	7·49	7·87	7·94	7·05	5·45
Oxygen	0·66	0·78	0·47	..	..	..
Nitrogen	29·41	38·66	140·78	184·23	270·45	307·10
Carbon dioxide	1·94	2·34	10·11	14·98	23·76	32·34
Water	8·34	11·60	38·85	52·55	72·67	75·61

The chemical changes comprised in the combustion of an ordinary gas-flame may be expressed in symbols thus—

$$2H + O = H_2O$$
$$CH_4 \text{ (Marsh Gas)} + 4O = 2H_2O + CO_2$$
$$CO + O = CO_2$$
$$C_2H_4 \text{ (Olefiant Gas)} + 6O = 2H_2O + 2CO_2$$

The ordinary form of a Bunsen burner is well known. The gas supply is caused to pass through a jet in a fine stream, into an open tube or chamber to which air has free admission. Passing upwards towards the burner orifice, the gas draws with it currents of air, with which it intimately mixes before reaching the point of combustion. The proportions of air and gas can be adjusted according to the pressure of gas and the relative proportional areas of the gas and air inlets into the mixing chamber. The perfect and intimate mixture of the gas and air is provided for in the calculation of the cubical area of the mixing chamber; whilst due attention is also given to the total combined area of the burner orifices, in relation to the combined areas of the air and gas inlets. There is no luminosity in the Bunsen flame; and the cause of this is at least twofold. In the first case, there are no solid particles present in this flame, as in an illuminating flame; and hence there is no incandescence. This appears to be due to the direct and simultaneous combustion of the hydrocarbons without any prior decomposition, and consequent liberation of carbon particles. The reason for this direct oxidation of the carbon and hydrogen is much disputed; but it is doubtless principally due to the diluting effect of the inert nitrogen present, and also probably to the intimate presence of oxygen in the midst of the flame. Gases so diluted cannot be raised to a temperature sufficient to cause decomposition and subsequent incandescence. The middle zone is, as already stated, one of incomplete combustion, but not to such an extent as with the luminous flame. There is no doubt that the cooling effect of the air present in the midst of the flame, and more particularly the inert nitrogen—is partly accountable for the absence of luminosity, as, if by any means the mixture can be strongly heated just prior to combustion, a distinctly luminous flame is at once produced. A similar effect results in the addition of a limited supply of oxygen, which immediately raises the temperature, and with it the luminosity, of the flame. This proves that the absence of light cannot be simply due to the rapid oxidation of the hydrocarbons. Lastly, an increase of atmospheric pressure will tend to increase the luminosity of the flame.

(To be continued.)

* See JOURNAL, Vol. LVI., p. 1335. † *Ibid*, p. 1141.

TECHNICAL RECORD.

THE ADVANTAGES OF GAS FOR COOKING AND HEATING.

In our report (*ante*, p. 167) of the General Meeting of the Association of Austro-Hungarian Gas Engineers, brief allusion was made to a communication by Herr C. F. Schweickhurt on "The Advantages of Illuminating Gas as a Heating Agent over Solid and Liquid Fuels." The following summary presents the essential points of the paper, which is given in its entirety in the Association's official organ *Der Gastechniker* (Vol. XX., p. 148).

Combustion, in its widest application, must be taken to cover all cases of combination with the oxygen of the air; but on considering the union of oxygen and iron, as observed in the common phenomenon of the "rusting" of iron and the burning of a combustible gas as it comes in contact with the air, one substantial difference will be noticed. In the first case, the union takes place without visible development of heat or evolution of light; while in the latter case heat and light are produced by the combination in a greater or less degree, according to the conditions obtaining. The "rusting" appears to result from a slow mechanical dissolution of the solid particles of iron by the oxygen; but where a body in the same molecular state of gas comes in contact with oxygen, an intimate mixture ensues, and the application of a flame causes a sudden chemical change, accompanied by evolution of light and heat. In the narrowest sense, combustion is limited to the case of chemical combination, with a development of heat and light, of bodies in the gaseous state with the oxygen present in air. In this sense, a solid or liquid cannot, as such, enter into combustion in the air. But, by the application of a light, a portion may be heated to such an extent as to be converted into the gaseous state; and then combustion of the gas may ensue, with a development of heat sufficient to cause further gasification of the solid or liquid, and consequent continuance of the process of combustion without external aid. Once started, the process may continue until only the earthy or non-gasifiable constituents of the solid or liquid remain.

In the ordinary methods of burning solid or liquid fuel, the process of distillation and gasification is, owing to the defective nature and working of the fireplaces and furnaces in use for the purpose, accompanied by loss in every direction. Apart from the solid particles of combustible matter which escape unburnt into the atmosphere, and pollute it, the incombustible matter present hinders the complete combustion of the rest of the fuel, and forms a residue which deranges the proper working of the combustion chamber, and acts prejudicially to the health of those living in the vicinity. All must agree with the utterance of the pioneer in the investigation of the technology of fuel—Sir William Siemens—that it is nothing short of barbarous to use coal in its natural state for household purposes, and that the time must shortly come when all raw fuel will be resolved into its constituents before it is delivered for use.

But it is not necessary to rely on the statement of an expert for support of the claim of gas to be the most advantageous fuel for boiling, roasting, and general heating purposes. A mere enumeration of the evils of the methods of firing at present in use, and of the advantages of gas firing, will suffice. In the first place, difficulties are inseparable from the condition of the fuel in vogue, and the cellar-room required for its storeage. Experience is necessary to judge the best time for purchasing, and the amount of space that may be advantageously

devoted to storeage, which in large centres of population must needs be very limited. A large number of people must be employed merely in the distribution and handling of the fuel. With gas the case is very different, as a practically inexhaustible supply is to hand day and night at a scarcely varying price. It does not require cellar-room nor protection against theft and risk of fire; nor does it necessitate constant watching of the market for a suitable opportunity to purchase. The store of fuel is not in the immediate neighbourhood of the place of consumption, and consequently is not exposed to danger of fire; and the inconceivable amount of work caused by the smoke and dust from solid fuel is avoided.

Erroneous inferences from the comparison of solid and gaseous fuel may be prevented by insistence on two facts in connection with the former—viz., its imperfect combustion, and its uncertain heating effect. Theoretically, according to the latest calorimetric determinations, 1 kilogramme of coal can yield 7400 units of heat, and 1 kilogramme (1·8 cubic metre) of illuminating gas 10,000 units of heat; or, stated otherwise, either 13 grammes of coal or 18 litres of gas would raise a litre of water from 0° C. to 100° C. But with a cubic metre of gas costing 10 kreutzer (equal to about 5s. 6d. per 1000 cubic feet), and a kilogramme of coal costing 1·6 kreutzer (nearly 32s. per ton), the cost of heating by gas is to that of heating by coal as 18 : 2·08, or nearly 9 : 1. Practically, however, the case is very different. From the moment of ignition, an extremely imperfect union of the particles of solid fuel with the atmospheric oxygen takes place, and much smoke is evolved, to the prejudice of health and the destruction of cooking utensils—involving enormous waste. At the lowest estimate, the waste of heat entailed by the combustion of the fuel remaining in the stove after the work in hand has been accomplished must be reckoned at 20 per cent. Finally, the heat cannot be nicely regulated according to requirements, as is possible with gaseous fuel. The supply of gas is stopped, by means of the tap, as soon as it is not required; and, moreover, the full heating power can readily be utilized, which is not the case with solid fuel. Calorimetric determinations carried out with specially-devised apparatus in the laboratory do not furnish any clue to the heat which can be obtained from particular fuels in the practical work of the kitchen; and experiments to this end must be conducted with the arrangements and under the conditions obtaining on the large scale. The question simply amounts to whether gas or the customary solid fuel is the more economical for the conduct of the ordinary household operations in a certain period of time—say, a day.

An exhaustive investigation of this question was carried out by Herr A. Buhe, Chief Engineer at the Dessau station of the German Continental Gas Company during the past year; and his experiments have since been repeated with care. Herr D. Coglievina, of Vienna, in 1885, made comparative experiments with gas and solid fuel; and these independent inquiries furnish the basis for the following table of the cost of preparing meals for a family of seven or eight persons with gas at 10 kreutzer per cubic metre (about 5s. 6d. per 1000 cubic feet):—

Meals.	Quantity of Fuel Consumed. Wood. Kilos.	Coal. Kilos.	Gas. Litres.
Breakfast—1 litre of coffee and 1 litre of milk, with 3 litres of water for scullery use. . . .	0·6	2·1	110
Dinner—1·7 kilos. of beef, vegetables, and 4·5 litres of water for cooking, 2 litres of rice soup, 0·555 litre of lentils, onions, flour, and butter, with 1·5 litres of water, 1·5 kilos. of roast veal with gravy, and 12 litres of water for scullery use . .	3·2	10·3	1462
Tea—same as for breakfast.	0·6	2·1	110
Supper—6 pork chops, 3 sausages, vegetables, and soup, with 3 litres of water for scullery use . .	1·9	6·2	511
Totals for the day . . .	6·3	20·7	2193

Cost of fuel: Wood and coal, 56·2 kreutzer; gas, 2193 kreutzer.

From this table it will be seen that the use of gas instead of wood and coal effects a daily saving of quite 28 kreutzer in an average household, or an economy of 8 gulden (nearly 16s.) per month. But, taking account of the periodical repairs to range, chimney sweeping, and other outlays incidental to the present method of firing, the yearly waste may be reckoned at quite 100 gulden (nearly £10). In a household of seven or eight persons, this sum would be saved by the introduction of gas in place of coal for kitchen use. In smaller households, the saving should be even greater.

In recent years, liquid fuel such as benzene, spirit, and petroleum, has been used at great sacrifice of safety and economy. The terrible danger to life and property involved is not accompanied by a corresponding decrease in household expenses; and this fact cannot be too often pointed out. The daily papers prove, by the numerous reports of accidents from petroleum and spirit burners, the reality of the danger; while if anything further is needed to convince those of the middle classes who have a predilection for them, of their wastefulness, the following table of the cost of heating a litre of water from 13° C. to 100° C. by gas and liquid fuel should serve:—

Fuel.	Time Occupied.	Quantity Used.	Price.	Cost.	Comparative Cost.
Gas . . .	11 min...	32 litres	.. 10 kr. per c.m.	.. 0·32 kr...	100
Benzene .	32 „	.. 20 grms.	.. 25 kr. per kg.	.. 0·50 „	.. 156
Petroleum.	28 „	.. 30 „	.. 20 „ „ „	.. 0·60 „	.. 188
Spirit . .	14 „	.. 0·034 litre	.. 50 kr. per litre	.. 1·70 „	.. 531

Thus, in round numbers, for heating purposes benzene is one-and-a-half times, petroleum twice, and spirit five times as expensive as gas.

Objections urged against gas-fires are the smell, and flavour said to be imparted to viands cooked by them; but these are solely due to imperfect ventilation and appliances. A gas-fire is frequently placed in a room without a chimney, because a coal-fire could not possibly be used; and, under such circumstances, it is not surprising that the air of the room is vitiated. Danger from fire caused by explosions or otherwise is much less than with other fuels. In fact, gas appears to possess in the highest degree those qualities which are demanded, on the score of safety, purity, and economy, of a fuel for cooking and heating purposes. Briefly enumerated, its advantages are:

(1) It is always available at a fixed price; avoiding the necessity for the troublesome and tedious distribution of wood and coal, and saving the rent of a cellar and loss of money from market fluctuations.
(2) Storeage of fuel in the immediate neighbourhood of the kitchen fire being unnecessary, the use of gas diminishes the risk of fire in a house.
(3) The full heating power is developed from the moment of lighting a gas-fire; thereby saving the time and labour spent on fire lighting, which in the case of liquid fuel is accompanied by danger, and accomplishing the work in the shortest possible time.
(4) Increase or decrease of gas consumption according to the requirements of the moment; taking the place of the inevitable stirring of the fire, or removal of vessels from it.
(5) The consumption can be controlled by the meter, so as not to exceed a certain limit ascertained to suffice for requirements.
(6) It can be used with advantage in small as well as large apparatus; the consumption being exactly proportioned to the work to be done.
(7) Scorching of food during cooking is completely provided against, since each burner can be turned down at any time, and the heat regulated to a nicety.
(8) The radiant heat from a gas-fire can be taken advantage of in winter for warming the kitchen, but in summer nearly wholly suppressed.
(9) The retention of the full flavour of food is promoted by gas cooking, through the complete control of the application of heat.
(10) No smoke is evolved from a gas-fire, and damage to property, cost of cleaning, and all the inconveniences associated with the smoke nuisance, are avoided.

THE COZE-DRORY RETORT-SETTINGS AT THE ERDBERG (VIENNA) GAS-WORKS.

In our report (*ante*, p. 167) of the Annual Meeting of the Austro-Hungarian Association of Gas Managers, mention was made of a lecture by Herr E. Körting on the subject of inclined retorts. From the full text of the communication which has since reached us, we abstract the following particulars.

The Coze settings, on the Drory system, were described by Herr Auzböck at the preceding meeting of the Association, from observations made at the Erdberg Gas-Works. The number of these settings at that station has since been increased by ten; and all have been in regular work for several months. The system may be briefly described as follows: From the waggons the coal passes through a breaking-machine, and thence, by a vertical chain elevator, to the horizontal conveyor, which runs along the whole length of the settings. From this the coal is dropped into hoppers, which open by means of a slide into the filling-boxes, running on rails beneath. The opening of another slide allows the coal to pass through the feed-pipes into the retorts to be charged. The coke is readily removed by a gentle push from above.

The lofty settings answered perfectly; but the success of the mechanical part of the installation seemed more problematical. Considering the prejudices of many gas engineers against any machinery in retort-houses, it was somewhat disquieting to think that the daily production of 25,000 cubic metres of gas depended on the proper working of a long chain of machinery. At first, indeed, some defects appeared; but an alteration in the method of driving the horizontal conveyor removed the chief difficulty. Parts of the machinery, such as are liable to break down, are kept in reserve; so that a broken portion can be replaced in a few hours. The large coal was found to separate itself from the dust in falling into the hoppers; and this caused inequalities in the weight of the charges, besides preventing the proper working of the feed-pipes, which were designed for uniformly mixed coal. As a remedy, the hoppers were filled from three traps in the channel of the conveyor, instead of from one as at first; and consequently the coal dust did not separate from the lumps to so great an extent. A weighted flap was hinged inside the feed-pipe where the latter is inclined; so that a greater resistance was presented to the passage of the coal when it was large, and the angle of inclination of the pipe was small, than when the coal was small and the pipe was

inclined at a greater angle. This device enables retorts to be equably charged notwithstanding variations in the quality of the coal, and ensures the carbonization of the correct charge each time. On this depends the success of the system. Tar, or rather pitch, collected at the lids of the lower mouthpieces; but a shortening of the latter kept them at a sufficiently high temperature to evaporate as soon as it was deposited.

From a technical point of view, there is little against Drory's system in its present form; and the results achieved in working may be at once considered. The cost of the erection of the setting is not so high as might be anticipated; being as 11·5 to 9 compared with that of an ordinary generator setting with horizontal retorts. The expense of the machinery is compensated for by a diminished working stage; and the manipulation of the inclined retorts on the Drory system is so simple and easy that an economy of 50 per cent. is at once effected in the current expenditure. But this figure must not be taken as the measure of the economy of the new system over the old. The furnaces for the same area have to produce from 20 to 30 per cent. more heat, in order to carbonize the correspondingly increased bulk of coal; and, moreover, the settings are much higher and more exposed to the air, both behind and in front. Consequently, a greater consumption of fuel might be expected with the Drory settings than with horizontal retorts.

In order that the experiment should be exhaustive, three methods of heating were tried. In the first, the secondary air was admitted without previous heating; the furnace door being close to the lower ends of the retorts, and the fire being partly available for direct heating. This furnace required from 17 to 18 per cent. of fuel, and did not maintain satisfactory heats. The second method was similar; but the secondary air was heated before admission. This required from 15 to 16 per cent. of fuel, and gave a better heat. Both were, however, unsatisfactory, in causing great local heating and destruction of the furnace walls, and were not easily fired. These faults were remedied in the third system, which was a Coze setting with generator and regeneration. The temperature of the retorts was as high as with the second variety; while the fuel consumed amounted to 13 or 14 per cent. The gases burnt directly under the retorts, and did not damage the furnace lining to so great an extent; while the firing was carried out with little labour—the coke falling direct from the retorts through a conical opening in the generator lid. The fire needed cleaning only once in 24 hours; the door for the purpose being placed on the opposite side of the setting, where the furnace man was able to work in greater comfort.

The arrangement of the retort-house has a great influence on its efficiency; and, according to Herr E. Drory, it should be different for his inclined retorts to that usually adopted for horizontal ones. The coal should be stored at the end of the house, so as to be near the breaking-machine; and there should be two rows of settings, with a space of not less than 33 feet between them. The charging and firing are done from this intermediate space; the drawing, from the other side of the settings. It is best not to have one house enclosing the two ranges of retorts, but simply a roof over each, so that the space between them may be tolerably cool for the stokers. The coke should be either at once charged into the breaking-machine, running on rails in front of the retorts, and broken for sale, or loaded into waggons for storeage.

In the Erdberg installation of inclined retorts, the local conditions have compelled the renunciation of some of the advantages claimed for them by Herr Drory; but much has been learnt by it, and its erection constitutes a decided step forward.

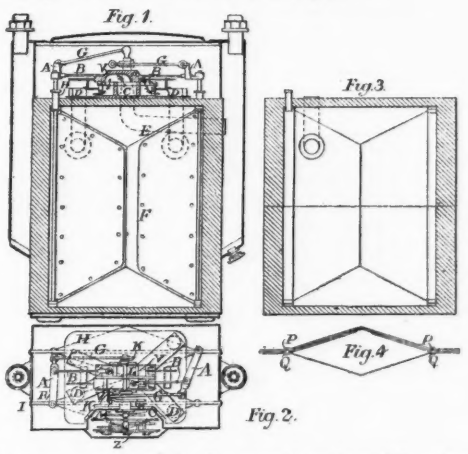
Mr. Alderman J. Baker, M.P. for Portsmouth, has been elected Chairman of the Portsea Island Gas Company, in succession to Mr. T. S. Edgcombe, who has retired through ill-health.

Leakage from Old Cast-Iron Mains.—According to a recently-published statement of Mr. Gilbert Murdoch, Superintendent of the water-works at St. John, New Brunswick, some noteworthy instances of leaks from old cast-iron mains have lately occurred there. The first of any importance was in a 4-inch main laid in "marsh mud." Some air cells were found in the body of the metal, but these apparently did no harm so long as the outside covering or skin retained its normal density. But this underwent a softening process, as had happened in other cases under similar conditions; and finally a piece was blown from the side of the pipe, following the course of the air cells. The film of metal covering these air and sand holes was about $\frac{1}{16}$ inch thick; and it could be cut easily with an ordinary knife. The pipe had been in use about 33 years, and its interior diameter was reduced about $\frac{1}{2}$ inch by turberculation. Another instance of this kind of failure occurred with a 6-inch main which had been in use 52 years. It was one of the first pipes made in the neighbourhood, and was so badly "sided" that when the cracked piece was cut out the metal on one side was found to be $\frac{3}{4}$ inch thick, while diametrically opposite it was but $\frac{1}{4}$ inch. The pipe was laid in soft, slaty rock, and the nature of the metal had been changed in some way, so that the outer surface was soft like plumbago—showing a bright, smooth surface when cut. Another burst was in a 24-inch main. The failure of the pipe is not of so much interest as the statement that the wood used instead of lead for jointing, when the pipe was laid nearly forty years ago, was as fresh and sound as when first driven home.

REGISTER OF PATENTS.

Gas-Meters.—Haas, E., of Mayence, Germany. No. 19,983; Nov. 5, 1892.

This invention relates to dry gas-meters; and the patentee claims, as the reason for his improvement, that, in the ordinary construction, "the slide-valves are very short proportionately to their width; and the slots or ports in the slide-face are also short and broad. For opening and closing the slots or ports, it is, therefore, sufficient to have but very short levers, and a slight to-and-fro movement of the slide-valves. A very slight shifting of the several parts of the operating mechanism relatively to each other, and the least wear or loosening of the joints, therefore produces a deleterious effect upon the proper opening and closing of the valves, which is the greater the shorter they are proportionately to their width. Such slide-valves cannot be guided exactly in a straight line; and a lateral oblique displacement interferes also with the proper opening and closing of the slots or ports in the slide-face, and consequently with the proper filling and emptying of the measuring vessels and the accurate measurement of the gas." Moreover, the "Haas gas-meter," as heretofore constructed, possesses the disadvantage that the slide-valve, which is provided on one of the two measuring vessels, is operated by the lever on the shaft of the vanes of the other measuring vessel; and if in this case the least shifting of the two measuring vessels relatively to each other takes place, the result is that on one side the port in the slide-face is covered too early, and on the other side too late, by the valve—thereby again causing incorrect measurement of the gas.



In the meter represented in the engravings, two slide-valves V are arranged side by side in the middle, upon the two measuring vessels; the valves being very long relatively to their small width, and being operated by very long levers A and connecting-rods B. Accordingly, the slide-valves in their longitudinal direction, and in the direction of their sliding movement, are parallel to the measuring vessels moving them; and a set or displacement of them cannot have a deleterious effect upon the proper operation of the slide-valves or upon the accurate registration of the meter. Owing to the length of the slide-valves, a very smooth rectilineal to-and-fro movement is obtained, and the valves slide very easily, and (as also by reason of the formation of larger ports in the slide-faces, which has the advantage that their sectional area becomes greater, and may be properly proportioned to the sizes of the other passages of the meter) there will be less loss of gas pressure, and fluctuations in the pressure which occur through the use of two small slide-valves will be obviated. The two slide-valves and slide-faces have only one common chest C, which comprises four chambers, communicating with channels D, leading to the measuring vessels, and a central chamber, which communicates with the outlet-pipe E. The levers which operate the slide-valves also transmit the oscillating movement of the partitions F in the measuring vessels by means of the rods G of the vanes, as well as by means of two cranks K secured upon a shaft L—supported in bearings fixed upon the plate H. The cranks, placed at a right angle to each other, are adapted to be adjusted on the journals of the shaft through a forked-shaped opening—that is to say, they may be made longer or shorter according to the depth of the corresponding measuring vessel and the amount of the turning movement of the lever. The cranks are then fixed by means of a clamping screw. On one of the cranks, the pin M is prolonged, as shown in fig. 2. This pin engages with a driver or tappet N, the axis O of which extends through a stuffing-box into the registering-device Z, arranged in a separate box in the outer casing of the meter.

Figs. 2, 3, and 4 show the arrangement of the measuring vessels. In these vessels, the shafts P of the vanes rotate in a tube Q, which, near the middle of the vessel, is only open far enough for the central vane to pass through. Moreover, the vessel is made of such a shape that this vane can bear at all points very tightly against the inner walls. The lateral flanges R of the measuring vessels also extend close to the tubes—limiting them outwardly, and enclosing also the membrane, which serves for a partition and forms only a short joint, so that it can no longer bulge out according to the greater or smaller pressure of gas acting on it, and thus alter the capacity of the measuring space.

Gas Heating and Cooking Stoves.—Willings, H. C., of Burdett Road, London, E. No. 6639; March 29, 1893.

This invention consists in providing a water space in the body of the stove, intersected by pipes or tubes in which air circulates. These tubes are preferably fixed in the top part of the stove; and the air is thus warmed, and caused to circulate, owing to the tubes being surrounded by the heated water. A boiler communicates with the stove water space by an aperture; and the bottom of the boiler or

heater being concave, permits of a flue passing through the heater, provided with a grid and shutter for cooking purposes when desired. The flue also carries off the products of combustion.

Hydraulic Mains and their Attachments.—Winstanley, G., of Coventry. No. 12,990; July 3, 1893.

This invention has for its objects (1) to reduce the weight of the hydraulic main and connecting-pipes, and thereby reduce the downward pressure on the mouthpieces of the retorts; (2) by shortening the ascension-pipes, to free the gas from the retorts early; and (3) to so form the dip as to obviate any tendency to stoppage.

Fig. 1

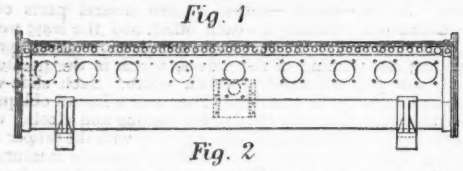


Fig. 2

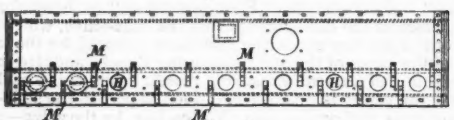


Fig 3.

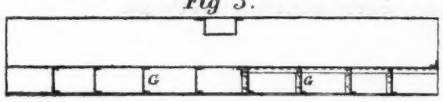


Fig. 4

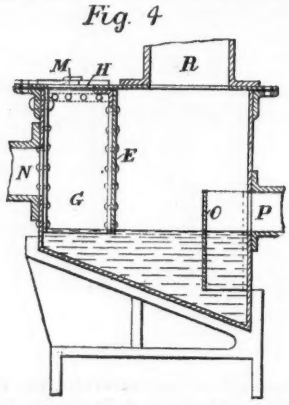


Fig. 1 represents a side elevation of a hydraulic main constructed according to this invention; fig. 2, a plan; fig. 3, a horizontal section; and fig. 4, a transverse section to an enlarged scale.

An open trough, having an inclined bottom, forms, with its cover-plate, a trapezoidal-shaped cross-section—its ends being closed by cover-plates. Along the whole length of the hydraulic main extends a division-plate or midfeather E, dipping downwards to within a short distance of the bottom of the main, and being joined to one of the outer side plates of the main by a number of short partition-plates G, which divide the whole length of the main between the side and the midfeather plate E, into separate compartments, access to each of which is obtained through an opening H in the cover-plate. The opening is normally closed by plug covers, secured in place by lugs, which engage with projecting brackets M on the cover-plate when rotated, and form together a kind of bayonet-joint fastening. Each separate compartment so formed is connected by an ascension-pipe N to the mouthpiece of a corresponding retort; and it replaces the ordinary dip-pipe—its downward opening or escape orifice being sealed by the contained tar or liquor (or both in combination) in the usual manner.

On the side of the hydraulic opposite to the dip compartments, is a hood O, which descends to nearly the bottom of the main, and to the inside of which the tar take-off pipe P is connected. This enables the heavier tar in the bottom of the main to be carried off by the tar take-off pipe, and thus reduce the resistance to the flow of gas from the retorts. The gas take-off pipe R is connected to the main cover-plate as shown, or to any other suitable part of the main.

APPLICATIONS FOR LETTERS PATENT.

16,171.—Lodge, J. W., "Mixing, converting, utilizing, reducing, or destroying towns' refuse, stable litter, tanners' and dye works' refuse, domestic coal-ashes, and gas-coke breeze, and the generation of steam thereby." Aug. 28.

16,221.—Wightman, W. G., "Lighting and extinguishing lamps." Aug. 29.

16,232.—Dinsmore, A. E., "Gas-making apparatus." Aug. 29.

16,245.—Prentice, J., "Fluid-pressure regulating apparatus." Aug. 29.

16,250.—Fletcher, B. M., "Fluid meters." Aug. 29.

16,411.—Garner, C. N., and Sherrin, J. V., "Gas-engines." Aug. 31.

16,429.—Chidgey, J., H., and W., "Water motors." Sept. 1.

16,497.—Southall, J., "Gas and oil motor engines." Sept. 2.

16,552.—Cock, F. W. C., "Gas or oil engines." Sept. 2.

Reduction in the Price of Gas at Carnforth.—The Carnforth Gas Company have reduced the price of gas to 2s. 9d. per 1000 cubic feet, with the view of encouraging the consumption of it for cooking and motive power.

LEGAL INTELLIGENCE.

THAMES POLICE COURT.—Thursday, Aug. 31.

(*Before Mr.* John Rose.)

The Improved Industrial Dwellings Company, Limited, v. East London Water-Works Company.

The Water Supply in East London during the Recent Drought.

In this case the East London Water-Works Company were summoned at the instance of the Improved Industrial Dwellings Company, Limited, for having "unlawfully neglected or refused to furnish to the said Company," a supply of water from Aug. 19 to 23, to certain tenements in Morrison Buildings South—the rates for each supply having been duly paid. There were in all nine summonses.

Mr. H. Newson appeared for the complainants; Mr. Reginald Bray (instructed by Mr. George Kebbell) for the defendants.

Mr. Newson, in opening the case, said the complainants owned, in the East London district, a large number of houses; but the summonses referred to one particular block known as Morrison's Buildings South, in which there were 45 tenements, inhabited by 155 persons. Ever since these buildings were erected, there had been disagreement with the Water Company as to the supply of water. In 1880, a summons was issued against them from this Court; and they were convicted. After that the supply was improved; but it got into a bad state again in 1889, and the Secretary had once more to threaten proceedings. But there was an improvement, and proceedings were not then necessary. This year, however, on the representation of the Sanitary Authority, and with the concurrence of the Water Company, the system of supply had been altered. Since this work was finished, the supply had at times been right and at times wrong. On the 18th ult., the tenants complained that they had no water; and the Secretary of the plaintiff Company (Mr. J. Moore) telegraphed as follows to the Water Company: "Morrison's Buildings, Whitechapel. No water in rising main or cisterns." He should explain that these summonses were limited to the tenements on the second floor, which were supplied with water by a rising main. The Secretary of the defendant Company (Mr. I. A. Crookenden) replied to the telegram on the same day, to the effect that he was sorry to hear they had suffered in regard to the water supply; that he had sent instructions to the district foreman to attend to the matter; and that, during the then tropical weather, it was very difficult to keep up a supply during the whole of the 24 hours. The tenants continued to grumble about the want of water; and on the 22nd ult., the plaintiffs' Secretary again wrote to the Water Company that, notwithstanding the complaints, a very large number of his Company's tenements at Bethnal Green and Morrison's Buildings were, at 40 feet, without water; and he had given instructions for summonses to be applied for against the Company. Mr. Crookenden wrote, in reply, that he supposed the shortness of supply was due to the waste of water, consequent on the abnormal drought, over which waste, he was sorry to say, the Company had only partial control. He added that he regretted the hostile step which had been taken, as he was sure his Directors would do all they could to remedy the matter. This was really the first promise on the Water Company's part to do anything; and he might say that, since the 24th, the supply had improved. Now in Mr. Crookenden's letter, the short supply was admitted. They complained, not of the drought, but of the waste by their customers; and he submitted that that was no answer to his clients. The defendants' remedy was against their customers who wasted the water; his clients were not in a position to prevent it. Counsel proceeded to refer to the clauses bearing upon the case in the Company's Special Act and the Water-Works Clauses Act, 1847—the sections which he quoted in the last-named Act being 42, 43, and 53. By the 53rd section, having paid the water-rate, they were, he pointed out, entitled to demand and receive from the Company a sufficient supply of water for domestic purposes.

Mr. *Butler*, one of the plaintiffs' Inspectors, first gave evidence, from which it appeared that on Aug. 19 he inspected Morrison's Buildings South, and found no water on the second floor, and a deficient supply to the closets throughout the building. He did not visit the place on the 20th; but on the three following days he did, and found no water on the second floor. The height of the inlet on the second floor from the pavement level was 26 feet. On the 18th, after receiving a communication from the tenants, he went to the offices of the defendants; and his complaint was taken down in writing by one of the clerks.

Cross-examined: On Aug. 19, he only went into one empty tenement, and tried the tap. On the 21st, he went into the empty tenement and two or three others; and again tried the taps. The next day he visited several, and, on the 23rd, all of the tenements on the second floor, and found no water. He was speaking now of the rising-main supply. He also went on to the roof and looked at the cisterns, of which there were nine, apart from the water-closets. There was a pipe from each cistern; so that each tenement had a double supply—from the rising main and the cistern. There was no water in the rising main on the second floor on the 23rd; but the supply from the cistern was on. He did not inspect the cisterns on the other days. There was a stopcock, which, if turned off, would prevent the water from the cisterns coming into the second floor; but this was not off on the 21st, so that the second floor could have obtained water if there had been any in the cisterns.

Re-examined: There was no water in the rising main on any of the days mentioned.

William Wellar, the porter at Morrison's Buildings, stated that he tried the taps connected with the rising main five times on Aug. 19, and found no water, neither was there water in the tanks from 7.30 a.m. to 12 p.m. On the 20th, there was water in the rising main at 8 a.m.; and the tanks were full, except two.

His Worship intimated that he did not think, after that statement, the summons for the 20th could be sustained.

Witness (continuing) said he again examined the tanks at 7.20 a.m. on the 21st, and they were full; but there was no water in the rising main on the second floor. In the evening there was no water. On the

mornings of the 22nd and 23rd, there was no water in the rising main; but it came on during the evening each day.

Cross-examined: Every day witness examined the tanks, and they were full, except on the 19th; but on that day at 6.30 a.m. there was water in the rising main, and again at 9.30 p.m. He did not know that the height of the tanks above the pavement level was 53 feet.

Several of the tenants were then called; but their evidence was rather conflicting as to the times the water came on in the rising main. However, they generally agreed that, on the days in question, excepting Aug. 20, they were only able to obtain water from the rising main early in the morning and in the evening. Two or three of the witnesses also asserted that they had not been able to get water from the rising main during the day since the alterations were made.

Mr. *J. Moore*, Secretary of the plaintiff Company, stated that, when Morrison's Buildings South were erected some 20 years ago, the water was laid on in consultation with the defendant Company. In that block of buildings, there were 45 tenements, nine of which were on the second floor. The system of supply was altered at the beginning of this year.

Mr. *Arthur Moore*, the Assistant Secretary of the Company, deposed that, before the alterations were made, he consulted Mr. Bryan, the Water Company's Engineer, and Mr. Hebler, their Superintendent; and they were carried out with their approval. Mr. Hebler expressed the opinion that it would be better to depend upon the rising main entirely for the second floor supply. Previously, the cisterns were placed below 40 feet, to meet the requirements of the Act. Mr. Hebler said he would not guarantee a supply to the cisterns if they were placed above the 40 feet; but he would in the rising main up to 40 feet. Therefore, all the tenements on the second floor should have been supplied, if there had been water in the rising main.

This concluded the plaintiffs' case.

Mr. Bray submitted that there was no case against his clients. It was perfectly plain from the wording that the summonses were taken out under section 43 of the Water-Works Clauses Act, 1847. The complaint against them was that they had "neglected or refused" to supply water; but really section 43 did not apply to this case. It was admitted by plaintiffs' witnesses that every day water was supplied, and that on every day there was water in the tanks, except on the 19th, and even on that day it was admitted that it came on in the evening. A supply of water was, therefore, tendered. In no part of section 43 did the words "sufficient supply" or "under pressure" appear in connection with the supply of water for domestic purposes. This section applied before the constant supply came into operation; and therefore, of course, it was quite sufficient if they gave a supply for one hour, or even half an hour, to fill the cisterns. There was no proof of the notice which was necessary to make the Company liable for a constant supply, nor had they been proceeded against under the Act relating to such a supply. Therefore, his first point was that there had been no breach of the section of the Act under which they had been proceeded against.

His Worship: The section says: "During any part of the time for which the rates for such supply have been paid or tendered." Suppose you pay your rates for a quarter, you may expect to get a supply "during any part" of that period.

Mr. Bray: The section says "refuse or neglect to furnish" a supply. Under this Act, we are only bound to supply water, which may be done at any time of the day.

His Worship: One construction is that you must supply at any moment.

Mr. Bray: Section 35 deals with constant supply, and from that we are exempt, under section 3 of our Act. We are being proceeded against under section 43 of the General Act for "neglecting or refusing" to supply water; and the word "constant" does not occur there. Continuing, he said the Company had done everything they could to maintain the supply. He was prepared to call the Engineer, who would prove exactly the pressure of the water at a point within 200 yards of Morrison's Buildings. The pressure undoubtedly went down to as low as 20 and 30 feet at certain hours on the days named, and at other hours it was up to 70, 80, and 90 feet. The consumption of water at this time was enormously greater than the ordinary daily supply—something like 4 million gallons in excess. The people who resided at low levels consumed so much water during the hot weather that it reduced the pressure, and made it very difficult to supply those who lived at higher levels. It had been shown that, at Morrison's Buildings, the tanks were filled every night, though they were at a height of 53 feet.

His Worship: It was stated that the supply has improved since the complaints were made.

Mr. Bray: Because the weather has become cooler. During August, our reservoirs went down quite one-half.

Mr. *W. B. Bryan* was then called; and, in the course of his evidence, he stated that, in the neighbourhood of Morrison's Buildings, there were a large number of small houses, and the consumption in that locality was considerably more during the month of August—this being proved by the loss of pressure. They registered the pressure at a place about 160 yards from Morrison's Buildings; and he had with him the diagrams for the days from the 19th to the 23rd of August. There would be a slight difference in the pressure between the place where the diagrams were taken and Morrison's Buildings. It was within his own knowledge that people did leave their water-taps open in hot weather; and then there was a large increase in the use of water for flushing sewers and so on. In the particular week to which the summonses referred, the extra consumption of water was about 4 million gallons per day—so great, indeed, was it that they had had to revert to, and the whole district was still on, the intermittent supply. Their storeage capacity was about 615 million gallons; but the amount stored had been reduced by one-half. During the whole of the hot weather, they were working their engines at the highest possible speed in the middle of the day. There was no doubt the pressure at Morrison's Buildings was reduced during the daytime, in consequence of the enormous consumption and the drought.

Cross-examined: In the week in question, the drought was so great that they could not supply to the level of 40 feet during a few hours of the day. On Aug. 19, the pressure was over the statutory 40 feet from 8.30 p.m. until 7.30 the next morning—in fact, it reached as high as 68 feet on that particular Saturday. He quite admitted that, for a portion of the day, there was no water in the rising main on the second floor of Morrison's Buildings. In Morrison's Buildings North, the whole of the supply was taken from cisterns; and in the South block, unless the stop-cocks were shut off, the tanks were filled every night, with the then existing pressure. If the complainants would only provide proper storeage, there would always be an ample supply for the whole of the tenements throughout the day. When Mr. Moore, jun., saw him with reference to certain difficulties the Sanitary Authority had raised, and as to the suggestion to increase the height of the tanks to 53 feet, and to supply the lower floors direct from a rising main, he (witness) told him distinctly that this would be a satisfactory arrangement, except in times of drought and frost, and that the Company could not guarantee in those times to raise the water to the statutory height of 40 feet.

Re-examined: The pressure shown on the diagrams proved that, if the stop-taps were open in the building, there would have been sufficient water in the tanks each morning of the days complained of to supply the tenants.

Mr. Newson said his evidence had proved that there was no water supplied to the second floor of Morrison's Buildings in the daytime; and he argued that, by section 63 of the Company's Private Act, his clients were entitled to a constant supply to the height of 40 feet. It was said by the defendants that the shortness of water arose from great waste. Their remedy, therefore, was to go against the customers who wasted it, and not make the others suffer. They could not say that because A. B. wasted water, C. D. should not have a supply. There was no evidence to show that the Company could not have sent water to the height of 40 feet on Aug. 19; and he maintained that they were bound to do it by Act of Parliament.

His Worship said he would take time to consider his decision.

Wednesday, Sept. 6.

His Worship delivered judgment to-day; and, in doing so, he cited the various sections of the Acts bearing on the case. Taking first the Water-Works Clauses Act, 1847, he pointed out that, by section 35, it was enacted that a supply of water sufficient for the domestic use of all the inhabitants of the town or district within the limits of the Special Act should be laid on under pressure; and, by section 36, a penalty was imposed for neglecting to lay pipes and provide a supply of water for domestic use, but not if the want of the supply should arise from frost, unusual drought, or other unavoidable cause or accident. Section 43 imposed a penalty for neglecting or refusing to furnish a supply to any owner or occupier entitled to it; and by section 53 owners and occupiers were entitled to receive a sufficient supply for domestic purposes. The East London Water-Works Act, 1853, incorporated the Water-Works Clauses Act, excepting, *inter alia*, sections 35 and 36; but sections 61 and 63 of the Special Act seemed to be in place of them. Section 61 provided a penalty for non-supply; but the Company were not to be liable if the want of such supply arose from frost, or drought, or other unavoidable cause. Section 63 declared that the water need not be constantly under pressure; while section 74 provided for a sufficient supply for domestic purposes. The Metropolis Water Act, 1871, section 7, provided for a constant supply on the requisition of the authorities; and section 6 enacted that every company should on Sundays, as well as other days, supply sufficient pure and wholesome water for the domestic use of the inhabitants within their water limits. Now it was not contended that the requirements of the 1871 Act as to the constant supply had been fulfilled. The summonses were framed on section 43 of the Water-Works Clauses Act, 1847; but he doubted whether that was the one applicable. But it was unnecessary to decide that question, or whether, as was argued by the complainants, they had a right to a constant supply; for he was of opinion that their right to a supply of water was subject to the provisions of section 62 of the Company's Act. He found that there was, on one or more days named in the summonses, an insufficient supply of water to the tenements; but the question remained as to the cause of the deficiency. The Company contended that it was due to "drought or other unavoidable cause or accident." It might be said that deficiency through more water than usual being consumed in a neighbourhood, was not "drought" within the meaning of the Act. "Drought" might be taken to mean such a causing of dryness in the springs as would limit the supply of water in the hands of the Company; but it might not apply to the heat causing a considerable consumption of water in excess of the usual consumption of a neighbourhood. Views as to the construction of the word "drought" were not, however, required, as, in this case, the deficiency was, in his opinion, due to "unavoidable causes." The defendants' Engineer showed that the Company did their best to overcome the state of things occasioned by the exceptional circumstances arising from unusual heat in probably the hottest month of an unusually dry year, and that the insufficient supply of water to the tenements at Morrison's Buildings arose either from "unusual drought," or other "unavoidable cause." Therefore, he thought that the exception clause of the Special Act applied; and the summonses must be dismissed.

Mr. Newson said he had to apply for a case; and he might state that the view of the complainants was, of course, contrary to that of his Worship. He contended that the exception did not apply to water supplies for domestic purposes.

His Worship observed that they were quite entitled to a case; and he should be pleased to state one.

Mr. Kebbell asked his Worship, seeing the importance of the case and the trouble and expense to which his clients had been put, that they should be allowed their costs. The complainants seemed to have entered into this piece of litigation as a sort of enterprise; and they had hoped to get a share of the penalties. He certainly thought this was a proper case in which to give the Company their costs.

His Worship pointed out that there had been a considerable deficiency of water. In his opinion, it was a fair dispute; and it must be remembered that the complainants had proceeded against the Company before with some success. Therefore he thought they had better leave the question of costs.

MISCELLANEOUS NEWS.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. FREDERIC LANE LINGING in the chair.

The SECRETARY (Mr. Magnus Ohren) read the notice calling the meeting; and the Directors' report and the accounts, of which an epitome appeared in last week's issue, were taken as read.

The CHAIRMAN, in moving the adoption of the report and balance-sheet, said the results of the half-year's working were about as favourable as they could have fairly expected, considering they had had a few drawbacks to contend with. Still they had realized a sum sufficient to pay in full the dividends upon the respective capitals, and to carry forward a small amount to the credit of the current half-year's accounts. He would name one or two of the causes that had affected the working, by which, he was sure, the shareholders would see there was nothing to lead them to suppose for one moment that the prosperity of the Company was losing its vitality. Indeed, the Directors had some sanguine belief that, with their new Act of Parliament, the future of the concern would be as firm and prosperous as it had been hitherto. It was, however, true that one of the blows they had had to parry was the less quantity of gas sold, as compared with the corresponding period of 1892. It amounted to 20 million cubic feet, or, as a percentage, it was very nearly 4½ per cent. less. It had arisen from one cause alone, and that was the singularly fine weather in the spring, which, of course, tended to induce a less consumption of gas for lighting and heating purposes. They did not stand alone in this respect; for he had noticed that, at the half-yearly meetings of most gas companies, this lessened consumption of gas had been alluded to by the Chairmen, and the reason given had been invariably that which he now submitted. He might fairly be asked if the electric light and oil had not come into competition with them. He could say at once, "No, they have not;" for he had before him a list showing that they had 29 houses which had taken the electric light to a certain extent, but the gas was still there, so that really the smaller quantity of gas sold in consequence of the electric light was simply a bagatelle. But certainly, he could say, without the least hesitation, that the electric light had not come into competition with them; and the same applied to oil. In addition to the loss (if he might so express it) that they had sustained in not selling so much gas, they had also to contend with a reduction in the value of their coke and tar. Under these two heads, the difference between the half year under consideration and the corresponding period of last year amounted to £2500. This was a large sum; but they had a singularly improved market for sulphate of ammonia—indeed, speaking from memory, he did not think the price realized had been so good previously during the past four years. He was glad to say that, the depression having been removed, the market for this commodity still held its own. Then with regard to another matter. They had followed in the footsteps of some other gas companies, and introduced into their district the automatic prepayment meter, by which they would be enabled to place within the reach of the small consumer, the mechanic, and the labouring man, gas to be burned by him in a way that his finances would allow. They had not hurried in this matter because, as they all knew very well, a novelty was frequently rushed at, and as frequently dropped. But it was a fact that there was a class of consumer who would take gas willingly, in preference to oil, in pennyworths at a time. They had only introduced the meter a short time; and up to the present, upwards of 400 applications had been received for them. Here the Directors believed they would have a means of getting a revenue which they would not obtain under what he might term the ordinary system of consumption, and for this reason: When the quarter expired, and the collector made his appearance for the gas account, even assuming that it amounted to only 6s. or 7s., it was often an inconvenience to the class he was speaking of, and the result was they would not burn gas. He was glad to report that they were also making headway with gas-stoves—having fitted up during the six months 234 new ones. Meters for private consumers had also increased by 238; showing that the Company's progress was satisfactory, and that, when the ordinary weather again arrived, they would derive the benefit of this increase. With regard to the capital, they had expended during the half year an amount approaching £8000—representing the balance due upon the new holder, the retort-house now in course of construction, and on other matters. He might here state that they would certainly want more capital to meet the demands which they felt would be made upon them. The proprietors would have noticed, by the circular that had been addressed to them, that the Directors had made a call upon the debenture stock. This was what was termed a permissive call; and they had found, from long experience, that it met with the approval of the shareholders, for it was not always convenient for them all to respond to an application like this. Those who were prepared to pay at once received the handsome interest of 6 per cent. at an early period; on the contrary, those shareholders who did not feel inclined to pay the call had the option of putting it off for a period. However, he might say, while on this subject, that the whole of the debenture stock would have to be called up before they encroached on the capital authorized by their new Act. This received the Royal Assent on July 27; and the Directors felt they had a very excellent Act to work upon in the future. Those shareholders who were at the Wharncliffe meeting would remember that he went minutely into the details of the Bill; and therefore they were perfectly aware as to the nature of its provisions. This measure, in its transit from a Bill to an Act, had not been seriously injured; and therefore they had the means of raising money in the future, for their capital powers were very liberal. They were 3 per cent. upon the capital, which was certainly more than was usual; and the Directors thought they would be enabled, by raising their money at a satisfactory and low figure, to hold an equitable balance between the interests of the shareholders and those of the consumers. With regard to coal, they had made a handsome reduction—£7704, or about 2s. 7d. per ton. This, as stated in the report, would, of course, have been better had they had the advantage of the new contract which they were now working under; but, if nothing unforeseen happened in the Durham coal-fields, this would show itself in the current half year. There had also been one or two other items of saving which he would not take up time by referring to. On the other side of the account, however, the gas-rental showed an increase of £483 compared with the first half of last year; but it was only right to say that this arose from the increase which was made in the price in March last. As regarded the coal carbonized, of course, having a reduced revenue, there had been 2210 tons of coal less carbonized; and the quantity of gas sold was 405,137,600 cubic feet, as against 425,231,200 feet in the June half of last year, or a difference, as he had already stated, of upwards of 20 millions.

Mr. GEORGE LIVESEY, in seconding the motion, remarked that he thought the Chairman had said everything that was to be said; and, therefore, though he had asked him (Mr. Livesey) to make a statement with reference to the new Act of Parliament, he felt that it was really unnecessary. However, the main points were that the 10 and 7 per cent. capital had been converted into an equivalent amount of 5 per cent. capital; and the new capital would all be issued at 5 per cent. The new capital powers were larger perhaps than they appeared to be. They were empowered to raise another £100,000 of ordinary capital at 5 per cent.; and it must all be sold by auction. They were also authorized to raise debenture stock, likewise at 5 per cent. (which must be sold by auction or tender), equal to one-third of the total paid-up capital. Now this debenture stock would amount to about £190,000, as it would be sold at a premium—he should say at no less than £130, and probably a good deal more, because the 5 per cent. debenture stock in one Metropolitan Company was now realizing £150. Therefore they hoped, to put a moderate estimate on it, that the new debenture stock would bring in about a quarter of a million—thus making the new capital powers quite £350,000, which would carry the Company on for a good many years. The other matters in relation to the Bill, as far as the shareholders were concerned, were mere matters of detail. As to the standard or initial price, the Directors contended for a sufficiently high figure to secure the present dividend. They said they could not accept anything less than 3s. 2d. for that purpose. The Directors were met very well by the Counsel on the other side. They said: "We will give you what you ask for; and you shall suffer no reduction of dividend until your price goes above 3s. 2d., but we will not allow you any increase of dividend until it goes below 2s. 10d." Being told they would give the shareholders this security for the present dividend, the Directors felt that, in order to avoid further opposition and trouble, it would be worth accepting what they were willing to assent to. The present price was 2s. 9d. Therefore, under the Act, they would be entitled, at the next half-yearly meeting, to a slight increase of dividend—only ½ per cent. for every penny, because the capital was 5 per cent., but it amounted to the same thing as ¼ per cent. for each penny on a 10 per cent. capital. As, however, they reduced the price of gas (as they hoped to do), the increase of dividend would be paid. For his own part, and he thought he was speaking for the whole of the Directors, they regretted they could not get more; but, looking at the Bill altogether, he thought they might be satisfied with what had been obtained. One good thing about it was that their relations with the Local Authorities remained as they were, although a very determined effort was made to bring the Company within the Metropolis under the vexatious and intolerable testing arrangements that applied to the three Metropolitan Companies. The House of Lords refused to accept their opponents' contention; and, when the Company thought they were settled, they found they were opposed again in the Commons by the London County Council, who fought most strenuously in order to bring the Company within their clutches. The Directors, however, had the satisfaction of knowing that the Committee agreed with them, and rejected the County Council's request. So strongly did they feel about it, that the Directors would rather have withdrawn the Bill than consented to this; but they were now "out of the wood," and might feel comfortable for a good many years.

Mr. BESLEY, Q.C., in the course of a few remarks, said he thought the Directors had achieved a great success in this Act of Parliament; and the explanation which Mr. Livesey had just given with regard to the rise and fall of the dividend by ½ per cent., instead of ¼ per cent., was perfectly satisfactory. The popular idea was that the shareholders had in some way or other been given away. Speaking of the poorer class of consumers, he suggested that, supplementary to the prepayment meters, they should have collections of gas accounts every month or fortnight. This, it was true, would mean the employment of a greater number of persons; but he was of opinion that it would be of considerable advantage. He was pleased to hear what had been said with regard to the electric light. It was certainly not yet a "glaring" terror for gas shareholders; and he for one did not fear its incursion upon their prosperity.

The motion was then unanimously carried.

On the proposition of the CHAIRMAN, seconded by Dr. F. HETLEY, dividends were then declared at the following rates per annum: 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, and 10 per cent. on the ordinary 10 per cent. stock, all less income-tax.

The thanks of the shareholders were tendered to the Chairman and Directors, on the motion of Mr. BESLEY, seconded by Mr. BEETON; to the Auditors (Messrs. Alfred Lass and A. G. Hounsham), on the motion of Mr. BEETON, seconded by Mr. NALTY; and to the Secretary (Mr. Magnus Ohren), and the Engineer (Mr. C. Gandon), and their respective staffs, on the motion of the CHAIRMAN, seconded by Mr. JAMES GLAISHER, F.R.S.

These votes were suitably acknowledged; and the proceedings then terminated.

Increase in the Price of Gas at Warwick.—Owing to the scarcity of coal, the Warwick Gas Company have issued notices to their consumers that, from the 1st inst., the price of gas will be raised 2d. per 1000 cubic feet; thus making the charge 3s. 6d.

SUNDERLAND GAS COMPANY.

The Annual Meeting of this Company was held last Wednesday. The report, the substance of which appeared last week, was submitted for adoption by the Chairman (Mr. J. Stokoe). In the first place, he referred, in feeling terms, to the loss the Company had sustained during the year by the death of Mr. E. C. Robson, their late Chairman; and then he proceeded to deal with the principal items in the accounts. In 1892 the wages amounted to £17,740, and during the past year to £18,409, which was an increase of £669. In 1892 they paid for coal, lime, and leading, £31,832; and during the past year £27,947—the difference being due to the alteration in the price of coal. Rates and taxes were £2636 and £2841 respectively—an increase of £265. Repairs, which in 1892 amounted to £8471, stood at £10,773—an increase of £2302, which was rendered necessary by the fact that, owing to the high price of coals, they did not act so vigorously in making repairs, as they had been accustomed to do in ordinary circumstances. The increase included some special items of expenditure which were not likely to occur again for some time at all events. Salaries, which were £3391, had only increased by £56. On the other side of the account, gas and meter rentals, which in 1892 came to £56,463, now stood at £58,101, which was an increase of £1637. There was a considerable falling off in residuals. In 1892 the amount received under this head was £22,237; and last year, £20,706—a decrease of £1531. A portion of this was to be accounted for by the reduction in the price of coke; and a more serious item was the considerable decrease in the price of tar. The total income of 1892 was £79,047; and of 1893, £79,174. The profit for the year was £14,790, and the statutory dividend amounted to £13,532, which would leave a balance of £1268 to be carried forward. This, he thought, was a very satisfactory and encouraging state of affairs. With regard to the works, it was stated in the report that an additional retort-house, gasholder, &c., were erected at Hendon. The consumption of gas having greatly increased during the past few years, the necessity of providing for still further demands had been forced upon the Directors; and they were accordingly obtaining tenders for the work. The policy of the Company had been for many years to anticipate their obligations, and to be always prepared to meet any increased demand that might be made upon them. They felt quite sure that they would very shortly be called upon for a larger supply of gas; and it was important that they should be ready to meet it. In 1883 the total quantity of gas sold was 413,000,039 cubic feet; and in 1893 it was 646,805,000 cubic feet—an increase during the ten years of 56 per cent. In that period there had been no extension of manufacturing and storeage power; but they had twice increased their purifying capacity. To meet the additional expenditure contemplated, it would be necessary to raise money. Fortunately they had that within their means; their Act of Parliament giving them certain financial powers, and they still had £40,000 of capital uncreated. He then moved the adoption of the report, and the declaration of a dividend of 5 per cent. on the original stock and 4½ per cent. on the additional capital for the past half year. The motion was adopted; and subsequently the Directors were authorized to raise the remainder of the additional capital authorized by the Company's Act of 1857.

PROVINCIAL GAS AND WATER COMPANIES.

A few further statements on the working of provincial gas and water companies were received last week; and these are dealt with in the following paragraphs:—

Gas Companies.

The annual meeting of the Cwmbran and Pontnewydd Gas Company, Limited, was held at Newport (Mon.) on the 26th ult. The Chairman (Captain C. H. Lonsdale), in moving the adoption of the report and the accounts, submitted that upon the whole the result of the past year's working was very satisfactory; and he pointed out that, notwithstanding the bad condition of trade in the district generally, which accounted for the reduced sale of gas, they had (as a result of the more skilful and energetic supervision of the present Manager, Mr. T. H. White), after spending a considerable sum in putting the works in order, as advised by him, secured an honest 5 per cent. dividend for the year just closed. The percentage of gas unaccounted for also showed a considerable reduction; being 5½ per cent., as against 8¼ per cent. in former years, and this, too, upon a reduced output. In recognition of the services of the Manager, the Directors had voted him an honorarium, and had also increased his salary in consideration of the collecting being done by him—an arrangement which, they were pleased to say, was working in every way to the interests of the Company. The motion adopting the report and declaring the dividend recommended was unanimously passed.

In moving the adoption of the report and accounts (see *ante*, p. 366) at the recent meeting of the Eastbourne Gas Company, the Chairman (Dr. G. A. Jeffery) stated that they were not in quite so prosperous a position as in the corresponding half year of 1892. This might be readily accounted for by the extraordinary weather they had passed through, since during the last three or four months they had had continued sunshine and intense heat. They had also had one day less for receipts, as 1892 was leap year; and another thing was the commercial depression, from which they had suffered and were still suffering. Notwithstanding these drawbacks, the Company were decidedly prosperous—that was to say, the consumption of gas in the past half year had been greater than it was in the first six months of 1892. With respect to the working, the manufacture of gas had been very good; and therefore very creditable to the Manager (Mr. J. Hammond). The output of coke, tar, and ammonia had been in their full quantities. The leakage had been reduced to a minimum—viz., only 2 per cent., or a little over. One rather substantial item in the balance-sheet was the cost of the appeal against the assessment. They could not help themselves. But in future years they would save £360 a year through having appealed; while he had no doubt that the saving they would make in the repairs and distribution would counterbalance the cost of the appeal. Then there was another large item. They had raised £10,000 additional capital, on which they had just begun to pay dividends, amounting to about £1000 for the year. He had no doubt, by a reasonable increase in the business, that at this time next year they would be able to declare the full dividend on this £10,000; and he hoped even then there would be some margin left. These were the salient points of the balance-sheet; and they were, all things considered, very satisfactory. The report was adopted.

At the meeting of the Harrogate Gas Company last Wednesday week, the Chairman (Mr. C. Allanson), having referred to the satisfactory result of the past half-year's operations and the continued increase of the business, intimated that considerable extensions at the works would be necessary, the plans and details of which were now receiving the serious consideration of the Directors. As the proprietors would be aware, they had had to incur considerable expense in opposing a Bill promoted by the Corporation, the provisions of which infringed upon the statutory rights of the Company. It appeared to him a matter of regret that the points ultimately conceded had not been granted at the initiatory stage, when the Directors addressed a courteous letter to the Corporation on the subject. The meeting unanimously agreed that the usual interim dividends should be paid.

The annual meeting of the Hartlepool Gas and Water Company was held last Thursday week, when the Directors reported that the year's working had not been so satisfactory as that of the preceding one, in consequence of the serious reduction in the value of residuals, amounting to £1720. They recommended the payment of a dividend for the second half of the year at the rate of 7 per cent. per annum, clear of income-tax. The amount earned fell short of the dividend by £959; thus reducing the surplus balance of the profit and loss account. As foreshadowed in the previous report, it had been found necessary to increase the manufacturing plant by the extension and remodelling of No. 1 retort-house, and the adoption of carbonizing plant of a modern and improved description. As to the water supply, the long-continued drought had severely taxed the resources of the Company in supplying water both for business and domestic purposes, and had rendered necessary the sinking of additional boreholes at Hurworth Burn. The Chairman (Mr. W. H. Fisher), in moving the adoption of the report, said the accounts were not so favourable as the Directors would have liked; but they had had very depressed times to contend against. Having remarked that the consumption of gas had reached a higher point than in the preceding year, he went on to say that they had been turning their attention to the modernizing of the works so as to produce the most favourable results. In reference to the supply of water, the Company had been placed in the position for the first time of having to ask their customers to economize as much as possible. The year had been one of unprecedented drought; and although they had the capacity for keeping the water, they had not the means of getting it until it came. So far as the water for domestic use was concerned, they were, they believed, quite capable of continuing the supply as hitherto; but for manufacturing purposes they were subject to the flow of the water into the streams attached to Hurworth Burn. At present, and for some time, these streams had been almost dry; but they had a little storeage, and they hoped this would last until the weather changed. The motion was carried unanimously.

The half-yearly meeting of the Hastings and St. Leonards Gas Company was held last Thursday. Mr. G. A. Thorpe presided, and, in moving the adoption of the report and accounts (which were noticed in our issue for the 29th ult.) he referred to the death of Mr. Joseph Brown, the late respected Chairman. He said that gentleman was well acquainted with all the details of the manufacture of gas, and had conducted their business for seven years as Chairman, and had been a Director for 21 years. He had presided over their meetings with great ability; and a vote of condolence had been sent to the widow and family, expressing the Board's sorrow at the severe loss they had sustained. With regard to the working of the half year, although they had had exceptionally hot and bright weather, the consumption of gas had augmented considerably. There had also been an increase in the number of cooking and heating stoves let out on hire. A new gasholder was in process of building, and was making satisfactory progress. The Directors proposed to increase the capital by issuing further debentures; and they also contemplated being able to make a reduction in the price of gas at the commencement of the year. They proposed to reduce it by 2d. per 1000 cubic feet, which, under the sliding scale, would mean a saving of £2700 to the consumers, and a profit of £700 to the shareholders. Of course, this probable reduction would depend upon the state of the coal market being satisfactory; and he hoped they would be able to carry it out. In reply to some remarks by a shareholder, the Engineer (Mr. C. E. Botley) explained that at the present time they obtained the very best market value for their residuals. They had, of course, in a place situated like Hastings, to pay a high price for coal; and they were far removed from any market for residuals such as tar. As the shareholders were aware, some years ago they could not possibly get rid of the residuals; and they had to cart a quantity away and burn it. But since then they had entered into a contract, and to some extent they were in the hands of the parties with whom they contracted. The price was based upon the scale paid by one of the best of the London Companies, and within a few years the contract would expire. Tar at present was a drug in the market; and, of course, it was impossible for them in a health resort to think of distilling it. There was really no profit in the distillation; and it was exceedingly offensive. Taking the Brighton Gas Company as an example, they obtained an equal value to them for their ammonia. In the course of further discussion, it transpired that the amount of the debenture stock proposed to be issued was £10,845; and the Directors hoped to get it at 3½ per cent. The new holder, it was mentioned, would cost £11,000. The report was unanimously adopted.

The Lewes Gas Company are able to report a profit of £1022 for the past half year. After providing for interest on mortgages, &c., the balance of net revenue, as shown in the profit and loss account, is £1427. The Directors recommend that a dividend for the six months be declared at the rate of 4½ per cent., leaving a balance of £217 to be carried forward.

In addition to the particulars which we gave in our issue for the 29th ult. concerning the Morecambe Gas Company, two or three

interesting items were imparted to the shareholders by the Chairman (Mr. W. G. Welch) at the recent annual meeting. Alluding to the growth of the town, he pointed out that, whereas the consumption of gas seven years ago was only 10,630,000 cubic feet, it had now increased to 29,675,000 feet. The revenue during the same period had also doubled, notwithstanding that several reductions had been made in the price charged. In order to keep pace with the increased consumption, the Directors had thought it desirable to erect a new gas-holder, at a cost of £5000, to raise which money there would be a further issue of 6 per cent. preference stock.

The report presented by the Directors at the half-yearly meeting of the Richmond Gas Company last Thursday week proposed that dividends of 5 per cent. on the "A" and "B" stock and 3½ per cent. on the "C" stock should be declared. It also announced that, in consequence of the Board having been able to make favourable contracts for coal, the price charged to consumers for gas would be reduced 2d. per 1000 cubic feet as from the end of the present quarter. The Chairman (Mr. Carless) moved the adoption of the report and balance-sheet, and said that the reduction of 2d. brought the price of gas to the same as that charged by The Gaslight and Coke Company; and when they considered the extra price the Richmond Gas Company had to pay for having their coal brought up the river, and the cartage from the docks to the works, he thought it indicated care, economy, and good management. The receipts showed an increase of £644. Mr. Noyce seconded the motion, which was carried unanimously.

The half-yearly balance-sheet of the Rochester and Strood Gaslight Company discloses a profit of £2901, out of which a dividend at the rate of 10 per cent. on the "A" and "D" shares and 7 per cent. on the "B" and "C" shares has been declared.

At the half-yearly meeting of the Shotley Bridge and District Gas Company on Wednesday, it was reported that the gas sold during the six months ending June 30 amounted to 19,232,000 cubic feet; being an increase of 12 per cent. over the corresponding period of last year. This, it was mentioned, included the recovery of lost consumption experienced during the strike of twelve months ago. The receipts for the half year amounted to £3751; and the expenditure to £2400—leaving a balance of £1351. This, after paying the interest on loans, would be sufficient for the maximum dividends, and leave £22 to be carried forward. The report was unanimously passed.

Water Companies.

It was reported by the Directors, at the recent annual meeting of the Brymbo Water Company, that the past year's net revenue, with a small amount brought forward, amounted to £2038. The interim dividend paid in March last required £723; and the interest on loans, £396—leaving a sum of £919. From this a dividend for the past half year has been declared at the rate of 5 per cent. per annum.

The revenue account of the Dorking Water Company shows that the receipts for the past half year were £1319; and the disbursements, £490—leaving a profit of £829, which is nearly £100 better than that for the corresponding half of 1892, in spite of the fact that about £106 more was spent for repairs and renewals. After providing for the interest on mortgages and on calls paid in advance, there remains £772 available for distribution. An interim dividend of 5 per cent. will be paid on the 30th inst.

The statement of accounts submitted by the Chairman (Lord Windsor) at the meeting of the East Worcestershire Water Company on the 31st ult. disclosed a net profit for last half year of £1001, which made the total amount available for dividend £2810. In moving the adoption of the report and accounts, and that a dividend of 2½ per cent. for the twelve months be declared, the Chairman said he was glad to think that the Directors were able to meet the shareholders under more favourable circumstances than they had ever done before. The endeavours they had made gradually to obtain a more satisfactory balance-sheet appeared now, after a great many years of hard work, about to be realized. He also observed that the increase in the water-rental—since 1891 especially—had been most satisfactory. The total rental in 1889 amounted to £1954, so that the rental for the past half year (£1926) was very nearly as much as for the whole of that year. The motion was unanimously adopted.

The receipts of the Lewes Water Company for the twelve months to June 24 last amounted to £3229, and the expenses to £1190. The disposable amount was therefore £2039. The interim dividend paid in February last absorbed £952 of this; and out of the remainder dividends have been declared for the past six months at the rates of 10 and 7 per cent. on the ordinary share capital.

The Directors of the Neath Water Company presented to the shareholders on the 29th ult., the report on the operations of the past half year, which included a statement concerning the arrangement which has been entered into with the Corporation for the transfer of the undertaking. The terms are generally that the Corporation shall take upon themselves the £8964 of debenture stock and bonds of the Company, and pay to the Company the sum of £37,070—making a total of £46,034. Special meetings of the shareholders and the ratepayers will have to be held to approve of the purchase; and an Act of Parliament will also have to be applied for by the Corporation to enable them to carry out the purchase. From the balance in hand, the Directors recommended dividends for the past half year at the rates of 8 and 5 per cent. per annum on the "A" and "B" shares; and these were agreed to.

Manchester Water-Works Sinking Fund.—By the Provisional Order promoted by the Manchester Corporation and sanctioned this session, an important alteration has been made in regard to the sinking funds of some of the departments. Alderman King, the Chairman of the Finance Committee, stated at the meeting of the City Council last Wednesday that, in the Water-Works Department, the immediate effect is to reduce the amount of the sinking fund by £17,966. The estimates of the present financial year provided for an amount of £35,816 for this purpose; but under the new Order, the amount is reduced for this year to £17,850. The yearly saving will, however, gradually diminish; and in about twenty years it will altogether cease.

NOTTINGHAM CORPORATION GAS SUPPLY.

Annual Reports of the Committee and Engineer.

At the Meeting of the Nottingham Town Council yesterday week—the MAYOR (Mr. Anderson Brownsword) presiding—the report of the Gas Committee, to which was appended that of the Gas Engineer and General Manager (Mr. W. R. Chester), for the year ending March 31 last was presented.

The Committee stated that the consumption of gas during the year was 1,402,605,200 cubic feet; being an increase on the previous twelve months of 52,104,600 cubic feet. The net profit was £24,048, or £424 less than the preceding year; the difference being fully accounted for by the great shrinkage in the value of coke and tar. In the early part of the year, there was a like depreciation in sulphate; but in the last quarter, a considerable advance took place, with the result that there was an increase in the return for sulphate of £877, compared with 1891-2. The difference in coke and tar, however, amounted to £3938. It was also announced that the contracts for coal for the current year had been taken very satisfactorily, and they showed a reduction of upwards of £9000. It was clear, from Mr. Chester's report, that the plant at the various works had been maintained in good condition during the year, and its efficiency had been generally increased. Considerable progress, he said, had been made with the renewals at the Eastcroft gas-works. The buildings and apparatus were now in an advanced state, and would be completed in time to be put into use during the ensuing winter. The application of the regenerative principle of heating retorts (which had worked so satisfactorily at the Eastcroft works) was now being extended to Basford; and a first installation of ten retort-settings was in process of erection in the new retort-house. The retorts, which had been fitted with all the most modern improvements, would be put into operation during the ensuing winter; and, in addition to the considerable economies effected in fuel, in wear and tear, and in labour, amounting to nearly 2s. per ton of coal carbonized, they would have an increased producing power of 37½ per cent. on the same area of land. With regard to the sulphate of ammonia works erected at Basford two years ago, Mr. Chester stated that they continued to yield the most satisfactory results. During the year, 10,742 tons 10 cwt. of ammoniacal liquor were dealt with, yielding 1114 tons 15 cwt. of sulphate. The cost of converting the liquor into sulphate at Basford was £2 19s. per ton, as against £5 9s. at Giltbrook, showing a clear gain of £2 10s. per ton in favour of the former works—this yielding an increased net revenue of £2700 more than would have been derived had the whole of the liquor been worked up at the Giltbrook works, as formerly. Provision had only been made at Basford for dealing with the liquor produced at those and the Radford works; the liquor made at Eastcroft being sent to the Giltbrook chemical works. He added that whenever the sulphate plant at Giltbrook required extensive renewals, it would be wise to discontinue its use, and to put down a modern plant at the Eastcroft gas-works, for dealing with the liquor made there. The steady growth in the production of tar during the past ten years, it also appeared, had rendered it necessary to make some additions to the manufacturing plant at the Giltbrook chemical works. A new tar-still and storeage tanks for naphtha and creosote were stated to be in course of erection. A new storeage shed had also been constructed partially out of the old plant pulled down at the Eastcroft gas-works. Some alterations of the existing tar plant had also been rendered necessary, in order to comply with the requirements of the Local Government Board. The distributory plant, Mr. Chester mentioned, had received careful attention during the year; and many mains and services had been enlarged and re-laid. This part of the apparatus required unremitting attention, especially in those districts where colliery operations were being carried on. The subsidence of the roads involved frequent disturbance of the mains, and consequent leakage and loss of gas. The loss from leakage and unaccounted-for gas (which still remained at an exceptionally low figure, considering the enormous district of supply) had gone up nearly 1 per cent. in the year, and could, he remarked, only be kept under control by a liberal expenditure on renewals, repairs, and maintenance of the distributory plant. As to the illuminating power of the gas, the average for the year was 19 candles—a slightly higher figure than had been ever before reached. The sulphur compounds had been kept down to 13·94 grains of sulphur per 100 cubic feet of gas—a degree of purity which, Mr. Chester observed, was only exceptionally attained in provincial cities and towns. Referring next to the meters, stoves, and engines in use, he said the number of the former on March 31 (including 316 lamp-meters) was 38,321; being an increase of 872. Of these, 36,275 belonged to the Gas Department, and 2046 to consumers. Prepayment gas-meters had largely increased; and at the end of the financial year, 657 were fixed within the borough. The application of gas for trade and domestic purposes, other than for lighting, likewise continued to increase—there being at present in use: Cooking-stoves (about) 2500; fires, 3500; and engines, 186; besides a very large number of other appliances of almost every description which had not been numbered. Of the 2500 cookers in use, 2174 were rented from the department. In the course of the year, 1297 new services were laid on, as against 954 in the preceding twelve months. Concerning the manufacturing operations, 143,355 tons of coal were carbonized; 1,502,510,000 cubic feet of gas were made; 1,402,605,200 cubic feet were sold; and 99,904,800 cubic feet were unaccounted for, or 6·65 per cent. The accounts showed that the total revenue for the year was £224,674; and the expenditure, £155,170—leaving a balance of £69,504.

Alderman FORD, in the absence of the Chairman of the Committee (Alderman Barber) through indisposition, moved, and Mr. J. BRIGHT seconded, the adoption of the reports and accounts.

Mr. BAGGALEY, in the course of a few remarks, referred to the subject of meter-rents, and said he believed the time had come when the Council ought to drop the somewhat vexatious principle of charging for the rent of meters. He was convinced the charge debarred many working-class people from using gas, who would be only too glad to be consumers if the rent was included in the charge for the gas.

Alderman Sir JOHN TURNEY said he might mention that the Gas Committee received £6000 a year for meter-rents—equivalent to 1d. per 1000 cubic feet if the charge was to be made inclusive, or to 2d. in the pound on the district rates if it were abolished altogether. Mr. Baggaley, he took it, was not asking for the abolition of the meter-rents as a relief to the manufacturers or large household consumers, but on behalf of the working classes. He (Sir John) thought their case had been fully met by the automatic supply system, which was now very generally adopted.

Mr. SKERRITT considered that meter-rents ought to be abolished, notwithstanding that they produced £6000 a year. The Committee, he believed, would soon recoup their loss by an increased consumption of gas.

Alderman FORD, in reply, said the penny-in-the-slot meter was coming into more and more general use week by week. No working man who objected to the meter-rent need now go without a cheap supply of gas. As the Committee had in contemplation a reduction of 2d. per 1000 cubic feet in the price of gas, and had to look forward to an income reduced by £10,000 a year, they could not at the same time entertain a proposal to forego the meter-rents.

The motion was then agreed to.

THE CRISIS IN THE COAL TRADE.

In the early part of the past week, interest in the strike of the coal miners was transferred from South Wales to the coal districts of Yorkshire, Derbyshire, and North Staffordshire, in which some very disgraceful scenes of violence and riot took place.

On Monday there was some serious rioting at Llanelly, which appears to have been generated by the importation of Scottish and English miners into the district; but by Wednesday—a detachment of cavalry from Swansea and some extra police having in the meantime arrived—peace was again restored. In accordance with the resolution passed at the Rocking Stone meeting the previous Saturday, the deputation then appointed waited on Monday upon the Emergency Committee of the Coalowners' Association at Cardiff; but they declined to receive them. However, to prevent misconception on the part of the workmen employed at the collieries connected with the Association, the Committee passed a resolution declaring that they would not "entertain any suggestions made by, or have discussions with, any person or persons other than those of the accredited representatives of the workmen on the Sliding Scale Committee." A final mass meeting was held at the Rocking Stone on Wednesday; and it was decided to resume work conditionally upon the masters paying the hauliers their arrears, and withdrawing the summonses issued, and paying the costs of the same. The 20 per cent. increase was abandoned. The immediate formation of a Miners' Union was also resolved upon. The meeting numbered about 4000; and there were delegates present representing many thousands of absentees. By Wednesday, several other collieries in South Wales had recommenced operations; and there was by that day no large company without some of their pits working. It was computed that at least 80 per cent. of the men were then again busily employed.

A cursory glance at the state of affairs in other quarters will suffice. Taking Nottinghamshire first, the Council of the Miners' Association held a meeting on Monday, at which replies were read from colliery owners to a circular-letter sent them, asking for a withdrawal of the notices of 25 per cent. reduction in wages, and to permit the miners to resume work on the former terms; but only one of the answers proved to be in favour of the men's request. However, the men are still of opinion that the owners will ultimately accede to their demands. One reporter states that he was informed that as large quantities of Durham coal were expected at the Sutton-in-Ashfield Gas-Works, a formidable body of colliers were marching on Monday to Sutton Junction to intercept the supply; but it was ascertained by a telegraphic inquiry that all was quiet there. Rioting, however, took place in the district on Monday night; and again on Wednesday there were some disturbances at Hucknall Torkard. On Tuesday afternoon a mass meeting of the Notts men was held, at which they passed an all-round resolution declaring against a reduction, arbitration, or a return to work at the old rates. But the greatest agitation was caused in various coal centres in Yorkshire by the violent action of the men; and the services of police and military had to be requisitioned. At Mexborough, Leeds, Wath, Morley, and Barnsley especially, disgraceful disturbances occurred; but one tale applies to all. Buildings and other property attached to collieries were burned or demolished; and men who were found working were brutally beaten. On Tuesday, about 1200 men marched to the Hoyland Silkstone Colliery, near Barnsley; and some men who were there filling trucks were compelled to flee, bleeding and bruised, from the premises. Mr. C. W. Fincken, the Manager (who, it may be remembered, was present at the meeting of the Eastern Counties Association of Gas Managers two years ago, and spoke on the question of the rise in the price of coal), was beaten over the head and pelted with stones. The rioters threw railway waggons off the lines, demolished the lamp-room, and otherwise did great damage. They then proceeded to the Rockingham Colliery, where they perpetrated similar acts of violence. They set fire to the coal stack in three places, wrecked the offices, tore up the books, scattered about the coal in the waggons, and drove all the men away, and broke a few of their heads. Similar disturbance occurred in various parts of Derbyshire and North Staffordshire; and, in regard to the latter district, the coalowners came to a decision not to allow the men to return to work under a reduction of 25 per cent. The Midland, the London and North-Western, and the Great Eastern Railway Companies have, in consequence of the strike, reduced the number of their trains; and the first-named Company decided last week to curtail the work at their extensive locomotive works at Derby, by closing them from Thursday to Monday, and on the same days in the current week. With regard to Scotland, the Mid and East Lothian miners resolved to accept the masters' terms, of submitting their dispute to arbitration; and, on Wednesday, they resumed work pending the result. The Fife and Clackmannan miners also agreed to the coal-owners' terms of 12½ per cent. advance; and the pits there were re-opened on Wednesday.

Shameful as were the proceedings of the men during the early days of the week, the lawlessness was greatly intensified on Thursday—indeed, so alarming became the situation in the disaffected districts of Nottinghamshire and Yorkshire that the Home Secretary ordered a large number of picked men of the Metropolitan police to be dispatched there by special trains. In the Leeds district, a large body of the colliers came into conflict with the police, who, in anticipation of trouble, had been stationed at the Chidswell Colliery. The police were armed with cutlasses; and during the *melée*, several men of both parties were more or less injured. Featherstone, however, was the scene of the greatest disturbance during the day. A report that several men had been employed during the night filling smudge at Ackton Hall pit (which belongs to Lord Masham), contrary to an agreement entered into by the Manager, and that eight waggons had been despatched to Bradford, greatly provoked the strikers. They furiously rushed to the pit; and all the men who were working—nearly 200 in number—had to take to their heels. The loaded waggons in the yard were all emptied. A detachment of 26 non-commissioned officers and men of the South Staffordshire Regiment was summoned from Bradford; and news of their arrival having spread, a mob of some thousands of persons, many of them bearing banners, gathered in the pit-yard at dusk. Most of them were already armed with bludgeons, and those not possessed of such ugly weapons quickly armed themselves from stacks of timber in the yard. Three tremendous fires were lighted, the whole of the premises were wrecked, and corves and anything which came in the way of the excited mob were hurled down the pit-shaft. A magistrate was called about 8 o'clock in the evening to read the Riot Act; and when the military proceeded to clear the yard, the mob pelted them with bricks and every conceivable missile. They received orders to charge the mob with bayonets, and, being assailed with volleys of stones, fired into the crowd. Several men were wounded, and four have since died. Scenes of violence of a similar character, which taxed the utmost energies of the police forces, occurred at Pontefract, Wakefield, Morley, Dewsbury, Sheffield, and Nottingham; and, in nearly every district, the services of the military had to be procured to assist in dispersing the large and excited mobs. On Thursday, Mr. Pickard, M.P., and other officials of the Yorkshire Miners' Association, telegraphed from the Trade Congress at Belfast: "We are sorry disturbances have occurred, and urge our members not to break the law." As to other localities, a telegram from Longton, Staffordshire, stated that about 1000 miners resumed work on Thursday morning at the old rate of wages at Birchenwood, Harecastle, and Langton Hall collieries, North Staffordshire; and from South Wales we learn that 20,000 additional miners had returned to work, and the district had resumed its normal aspect. In connection with the rioting at Llanelly referred to above, a number of arrests were made on Thursday. It was estimated that 5000 men were idle in the district, and work will not be fully re-commenced until this week. In consequence of the stoppage in the coal trade, the Wigan Coal and Iron Company have decided to damp down their blast-furnaces and close the coke-ovens.

On Friday afternoon another attack was made on the Ackton Hall Colliery, at Pontefract; but attempts to set fire to several coal-waggons and to tear down a tall chimney were frustrated by the military. The situation in other districts remained exceedingly acute; and large contingents of police and soldiers were sent from London and elsewhere to assist in quelling the riots and maintaining peace. In the House of Commons on the same day, a motion for the adjournment of the House was made by Mr. Brunner, in order to discuss the disturbances. Both the Chancellor of the Exchequer and the Home Secretary stated that, as the Government were not in possession of complete information on the subject, it would not be expedient to discuss it at present. Mr. Asquith added that he earnestly trusted those who had influence with the miners would exercise it. The motion was ultimately withdrawn.

The excitement in the various districts continued on Saturday; but, beyond a riot at Whitehaven, which was of short duration, and in the course of which several of the new electric street lamps were smashed, nothing of a serious nature occurred. One of the men who died from a bullet wound at Featherstone on Thursday was interred in the presence of several thousands of persons; and an inquest was opened on the body of another man named Duggan, but it was adjourned until to-morrow. In the different areas, the police and military forces were greatly strengthened, at the request of the authorities and colliery proprietors. Respecting North Staffordshire, the strike it at an end. At a well-attended meeting of the coalowners of the district, held at Stoke on Saturday afternoon, the following resolution was passed: "It having been reported to this meeting that the miners have offered to resume work at the old rate of wages, and to accept without notice, concurrently with other districts, the terms of any settlement that may be arrived at between the federated coalmasters and the Miners' Federation of Great Britain, the North Staffordshire coal and ironstone masters, considering the great amount of distress existing in the district, hereby resolve to allow the men to return to work at once on these terms." Great hopes are being entertained that the present crisis will to some extent be brought near a settlement by the miners' conference to be held at Nottingham on Thursday next.

At last Wednesday's meeting of the Leeds City Council, Alderman Gilston stated that the Gas Committee had in stock a quantity of coal sufficient to last three or four weeks; but they had, at a meeting held that day, decided to purchase another 1000 tons, at a moderate price, although it was, of course, an increase on the amount they had previously paid. In consequence of the advance they had had to pay, they had decided to put up the price of coke. On the same day, at the meeting of the Salford Town Council, Mr. Holland, the Chairman of the Gas Committee, was interrogated by Alderman Dickins with regard to the coal supply; and, in reply, he stated that at present the Committee were not purchasing coal, and would not require to do so for some time. It was true that the firms with whom they had contracts were not delivering coal; and, in consequence, they were now working from stock. It was reported, at the meeting of the Briton Ferry Local Board last Tuesday, that there was only sufficient coal at the gas-works to last another ten days; but, as the strike in the district was practically over, no steps were taken to replenish the stocks.

SCARCITY OF WATER IN THE PROVINCES.

The long-continued absence of rain, and the great heat of the past few weeks, are causing much anxiety throughout the country to the authorities responsible for the supply of water; and, during the last few days, the position of affairs has been earnestly discussed by several public bodies.

At Manchester, Sir John Harwood made a statement on the subject in the City Council on Wednesday. From his remarks, it appeared that the last time the Water Committee turned off the supply at night was on June 19; and there was then a supply sufficient for 49 days. They resumed the full supply on Aug. 9; and on that day they had 41 days' supply. They had fallen now to 24 days' supply; and the matter was becoming very serious. He reminded the members that they must have regard to this fact, that on June 19 practically they were in midsummer, and could not look forward to a really satisfactory supply of rain. Therefore the danger was nearer at that time than it was now, because in September they might reasonably hope that, within two or three weeks, they would have rain. The full supply, however, might safely be continued till the following Friday, when, if there was no change, they would cut the water off at eight o'clock in the evening, and resort to the means adopted a short time ago. In reply to a question, he said that he had not the figures with him, but, speaking from memory, he believed that of the daily consumption, about 20 million gallons came from the reservoirs, and about 6 million gallons from the springs. Dr. Simpson made a statement to the effect that the water the consumers were now receiving was of a very inferior quality, containing an abundance of animal life which was visible to the naked eye. Such life was not noxious, nor perhaps did it in any way affect health; at the same time, added the Doctor, one naturally preferred his water to be free from these organisms. He also inquired of Sir John Harwood if there were no possible means of expediting the supply of water from Thirlmere. That gentleman, in his reply, assured Dr. Simpson that his anxiety about the quality of the water was fully shared by the Water Committee, who were taking extraordinary precautions. In regard to Thirlmere, he had to say they could have no water from that source at present. According to the Act of Parliament, before they could draw water, they had to make a certain road over an embankment, and they could not do this before next May or June. If they tried to get the water now, there were those who, knowing the provisions of the Act, might seek to restrain them by injunction in the Law Courts. If the city was in real straits, they might possibly get permission from the Local Government Board to break through the provisions of the Act and open the valves before the roadways were finished.

The same day, a report on the water supply was submitted to the Newcastle City Council by the Sheriff (Mr. Riley Lord). It stated that on Aug. 31 the Water Company had 727 million gallons in store; being a decrease of 1791 millions as compared with last year. The decrease during July was 409 million gallons. By Act of Parliament, when the water fell to 500 million gallons, the Company were prevented from supplying water to the North Shields Company. The Town Clerk had written to the Secretary of the Newcastle Company, asking that they should discontinue the further supply of water to North Shields. Since Aug. 31, there had been a further decrease of 55 million gallons. Included in the present storeage was the water in the Great Southern reservoir, drawn from the River Tyne for trade purposes; so that within two or three days the domestic supply would fall to 500 million gallons. The river water was not, of course, for domestic use; but it was feared that, in some of the workshops and offices, it was used for drinking purposes. Certain members thought the Council should suggest to the Company that the supply should be limited to two or three hours daily for a time, and also that they should obtain a decisive undertaking from them to stop the supply of water to Tynemouth. It transpired that the Directors of the Company were going to have a meeting to consider the subject on Tuesday (to-day); and the discussion ended by a resolution being passed, instructing the Gas and Water Committee to await the Company's decision, and then to make arrangements with them as to the supply of the district at such times as the Committee approved. In consequence of the continued diminution in their stocks, the Company issued a notice on Thursday that it was their intention to cut off for a time the supply of water during the night. On the same day, a representative of a local paper had an interview with the Chairman (Alderman Potter, C.B.), and elicited from him some very interesting facts, one of which was that during the past eight years the average daily consumption has increased by 3 million gallons. The Company are, in consequence, now extending both the area from which they derive their supply and their means of storeage. At a cost exceeding half a million, the country watered by the Reed is being tapped; and eighteen months hence the requisite engineering works will have been completed. The capacity of the Company's reservoirs will then be increased by no less than 14,000 million gallons; the grand total being brought up to 17,061 million gallons. It is estimated that no further addition will be required for at least a quarter of a century.

The members of the Stockport Town Council had their attention directed to "the unsatisfactory state of the water supply in the borough," by Lieut.-Col. H. Turner, at their meeting last Wednesday; but the bent of his remarks led to some discussion on the subject of the acquisition of the Water Company's property. The gallant member said that, as far back as 1866, complaints were made of inadequate pressure, impurity, and hardness of the water; and the Corporation at the time offered to purchase the plant and rights of the Water Company for £130,000. In 1881, the Company asked £400,000, with liability for preference dividend and debenture interest. Nothing more was done in the matter until 1885, when the negotiations again proved fruitless. As compared with other towns, the charges made on the consumers by the Company were excessive. He took it that the consideration of dividends had been responsible for the curtailment of the water supply this summer. He could not think that the drought was a sufficient reason, because the Company ought to have kept up their stock by drawing earlier from their auxiliary sources. The water obtained from the wells by pumping was much too hard, and ought to be softened, as was done in other towns, before being supplied to customers. He noticed that, at the recent meeting of the Company, the Chairman (Mr. G. H. Hill), who was the Engineer of the Manchester water scheme, congratulated the Company that they would be able to get a supply of water from Thirlmere (see *ante*, p. 410). Did it not seem, he asked, rather anomalous that the servant of another Corporation should offer their water to a private Company in which he was interested? and would it not be much better that the Stockport Corporation should be in a position to deal direct with the Manchester Corporation? He ended by moving that several members named by him should be appointed a Committee to inquire into the unsatisfactory state of the water supply and report to the Council. Alderman Robinson, who seconded the motion, said, with respect to the Thirlmere scheme, that one of the conditions on which Manchester was granted the Thirlmere scheme was that they should supply, on certain terms, the towns surrounding the city. Mr. Hill stood at the very head of his profession; and, on his recommendation, the Isle of Man water-works were purchased by the Commissioners for £140,000. There was not a Director of the Stockport Water Company who would not be willing to sell to the Corporation—indeed, they believed the Corporation was the proper body to own such works. At what price? inquired Lieut.-Col. Turner; and Alderman Robinson replied not at the vendors' price, not at the purchasers' price, but at the price to be stated by qualified valuers. The Company, he added, had in contemplation the sinking of a well of their own, with a view to meeting any difficulty in future, and were entering into arrangements with the Manchester Corporation which would ensure an unlimited supply. There was only one opponent to the motion. The Directors last week gave notice that they were reluctantly compelled to curtail the supply in certain localities from 8 p.m. and 5 a.m.

The drought has reduced the water supply of Dublin to such an extent that the greatest care and economy will be required on the part of the citizens to avert the calamity of a water famine. The Corporation Water Committee have already been forced to discontinue watering the public streets; and they have appealed to the public not to waste the water or use it for any other than purely domestic purposes. They likewise contemplate stopping the supply for certain hours of the day and night; but they have not yet given notice of such action. The Vartry works were originally constructed to supply an area of 12 square miles, but they are now employed to serve about 28 square miles.

The amount of water which the Leeds Corporation have in store is also seriously diminishing. Mr. Harland informed the members of the City Council last Wednesday, that the Water Committee had had the supply cut off from eight o'clock in the evening to five in the morning; but it had become a question of doubt now as to whether they would not have to resort to a further restriction. They found that day they had a sufficient reserve, independent of pumping, to last the city for 28 days, as against 30 days' supply six days previously. With pumping included, they had 35 days' supply. During the past six days, the saving had averaged something like 2,100,000 gallons per day. Matters had now reached such a crisis that it became the absolute duty of the whole of the inhabitants of the city to exercise the strictest economy in the use of water. The scarcity of water, as they knew, was the result of the dryness of the season. Looking at the rainfall in 1892, they found they had 34·39 inches altogether; while up to September of that year, it was 21·82 inches. This year up to the present time they had only had 16·79 inches of rain, or 5 inches less than during the corresponding period of last year.

The supply at Bolton, Ashton-under-Lyne, Stalybridge, Mansfield, Holbeach, Long Sutton, Truro, Yeovil, and many other places, was reported last week to be very low. At Bradford it was stated that the high-level supply was only equal to three weeks' service; but, as to the low level, there was fifteen weeks' supply in store.

The Proposed Purchase of the Gomersal Water-Works by the Local Board.—The Gomersal Local Board yesterday week resolved to tender the Gomersal Water Company the sum of £7500 for their plant and interest; and, in the event of this proposal not being accepted, they expressed their willingness to refer the matter to arbitration. It will be remembered that the Company recently offered to part with the concern for £10,000.

The Great Northern Railway and the Electric Light.—The Great Northern Railway Company are going to light by electricity their two principal stations in the London system—viz., Finsbury Park and King's Cross. The electricity will be generated at large works the Company have built at Finsbury Park, where they also manufacture compressed gas; and the current will be conveyed by cables to King's Cross station. The cables are being put under ground on the up-line of metals, and are very carefully insulated, so that the induction shall not affect either the telegraph or telephone lines alongside them.

Extension of the Constant Water Supply System in London and Charges by Meter.—In the House of Commons last Tuesday, Mr. Isaacson asked the President of the Local Government Board whether his attention had been drawn to a notice issued by the Grand Junction Water Company to alter and adopt, at a considerable expense to householders, the existing service, so as to render it suitable for a constant supply; and whether the Government would now bring in a Bill to compel Water Companies to charge by measurement for the water used in all houses over £100 per annum. Mr. H. H. Fowler said he was aware that the Grand Junction Water Company had given such a notice as that indicated in the question; but it was only an extension of the system generally adopted by the London Water Companies. As to the suggestion in the second part of the question, it was one which he could not recommend. The whole policy of the mode of payment for water was one of a statutory character, and went on the assumption that houses should pay, not according to consumption, but according to their rateable value; and that was a provision largely in the interests of the working classes

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

On Thursday of this week, the accounts of the Glasgow Gas and Electric Lighting Committee, for the year ending May 31 last, were approved by the Town Council. Mr. Mitchell, who moved their approval, made a short speech of a not very interesting nature. This is not greatly to be wondered at, seeing that all the members had received copies of the accounts a month previous; and from their clear setting out, it was probably unnecessary to say much in the way of amplification. It always appears to me, however, that gentlemen in the position which Mr. Mitchell occupies, forget that the whole public have an interest in a corporation gas department, and that the annual statement of the committee of management is almost the only opportunity they have of learning how the undertaking fares. The amount of the capital account is £1,415,000, of which £1,000,000 is loan capital, and the balance is the share capital of the old Companies. The expenditure upon works has been £1,135,198. Of this sum, no less than £137,316 was expended last year; the principal items of which were: £53,324 upon the extensions at the Dawsholm works; £46,898 upon the Temple Farm station and works; £16,426 upon extensions of pipes; and £10,646 expended upon gas-meters. During the year, there was received for gas £515,741; for coke, £30,227; and for ammoniacal liquor and tar, £43,792. There is no reserve fund; but there is a sinking fund, which the Corporation has raised during the year from £251,988 to £266,446—showing an increase of £14,457. The Treasurer, Mr. Fleming, has this year prepared an abstract statement of the capital, revenue, and profit and loss accounts, which shows what might be called "the rise and progress" of the gas undertaking. When the Corporation took it over, in 1869, there had been expended on works £532,317. The account rose rapidly till, in 1878, it amounted to £1,002,327. In that year, however, there began the policy of redeeming loans out of the sinking fund; and the capital expenditure account fell year by year, till in 1888 it was as low as £605,249. In that year it began again to rise; and the increases have been as follow: 1889-90, £31,883; 1890-91, £63,343; 1891-92, £331,328; and last year, £103,295. In 1869 the gross revenue was £235,701; last year it was £594,049. In the former year the gross expenditure was £173,955; while last year it was £464,450. Gross profits have risen in the same period from £61,745 to £129,600. During the 24 years that the Corporation have had the management of the undertaking, there have been deficits in only four years; in all the others there were surpluses, ranging from £72 to £24,937. Perhaps what is as good an indication of the general progress of the undertaking is to be found in the figures relating to the price of gas. In 1874, when the charge for gas was 5s. 5d. per 1000 cubic feet, the gross revenue was £378,392; in 1884, with gas selling at 3s. 6d., it was £428,227; and in 1891, with gas at 2s. 6d., it was £547,473. After one year with gas at 2s. 9d. per 1000 cubic feet, the price is again reduced to 2s. 6d.; and it is to be hoped that the same elasticity will attend the revenue which it has manifested in former years. Unaccounted-for gas fell last year from 10·88 to 10·82 per cent.

The Corporation of Edinburgh are as far as ever from a settlement of the subject of the lighting of common-stairs. In Leith, a scheme has been adopted, under which the residents light the lamps at dusk and the Corporation send round lads at fixed hours to extinguish them—the Corporation charging the cost of gas and of extinguishing the lamps upon the residents, and accounting to the Gas Commissioners for the gas consumed. In connection with this arrangement, the Gas Commissioners very generously offered to supply gas at the same rate as they do for public lighting, which is 1s. per 1000 cubic feet less than the charge to ordinary consumers. The scheme was proposed last winter; and Leith has adopted it. In the expectation that Edinburgh would do the same, the Gas Commissioners only entered into contracts for the supply of gas to the residents till the 15th inst. Now the Edinburgh Corporation have resolved not to proceed further with the scheme in the meantime; and thus all the labour which has been bestowed upon it, and all the trouble which has been given to the Gas Commissioners, is wasted There is no reason for regret, as the idea was not a very workable one. It is not generally known that the Corporation purposed to take powers in a recent Act of Parliament to light and extinguish those lights; but the lights being upon private properties, when they sought a clause indemnifying themselves for anything which might arise in consequence of omission to light, Parliament declined to give the protection asked for, and the clause was dropped.

Last year was a most satisfactory one to the Kilmarnock Corporation. Out of a gross revenue of £14,321, there was derived from the sale of gas £12,172. This was an increase of £362 upon the preceding year, and was derived from the largest consumption of gas which has been experienced since the works were established in the town. The output was 82 million cubic feet—an increase of 2½ million feet upon that for the preceding year. There was a leakage of 10·88 per cent., as against 11 per cent. the year before. The yield of gas per ton of coal was also improved, having risen from 9000 to 9200 cubic feet; and there was a better yield of tar, the quantity produced being 139,044 gallons—an increase on the preceding year of 22,634 gallons. The amount derived from the sale of tar was, however, only £609, a decrease of £361. The average production of tar was 15½ gallons per ton of coal. There was a yield of 99 tons of sulphate of ammonia, as compared with 87 tons, which is ascribed to the working of the new scrubber; and the average production was 23·71 lbs. of sulphate per ton of coal—1·44 lbs. more than the preceding year. The total quantity of coal used was 8913 tons, as compared with 8852 tons; and there was a profit on the year's operations of £1229, to which was added £6895 brought forward. Only £100 was required to be placed to the sinking fund for payment of mortgage debentures; and the chief item of expenditure from the profit and loss balance was £743 for new scrubbers, condensers, &c. A sum of £7401 has been carried forward to this year's accounts. I do not think I ever saw such a complete record of favourable results as the Manager (Mr. W. Fairweather) has been able to put forward; and both he and his Committee are to be congratulated upon their handling of the undertaking in such a masterly way.

There is again a talk in Dundee about the reform of the Gas Commission, by making it directly representative of the community it serves. The Town Clerk (Mr. W. Hay) having died, there has been a sort of amalgamation of the Town Council, Police Commission, Water Commission, &c., by appointing the Clerk to those bodies, Dr. Thornton, to be Town Clerk. The proposal is that the Gas Commission should be abolished; and that the management of the gas undertaking should be placed in the hands of a Committee of the Town Council, as is done in Glasgow and Aberdeen. The subject is likely to be agitated before the electors at the forthcoming municipal elections.

The Corporation of Glasgow have obtained the sanction of the Secretary for Scotland to the borrowing of £100,000 for electrical purposes. There is still a good deal of work to be done in the completion of the original scheme of electric lighting; and it is expected that there will be a largely augmented demand for the light within the area of supply, for shop and domestic lighting.

The little town of Carnoustie comes into view this week, in connection with both its gas and water supplies. On Wednesday, the local Gas Company held their thirty-eighth annual meeting, at which it was reported that the net profit for the year was £478; and it was resolved, on account of the fall in the price of coal, to reduce the charge for gas 2½d. per 1000 cubic feet. The water supply question has given a good deal of trouble of late years. It will be remembered that last spring the Police Commissioners declined an offer by the Dundee Water Commission to provide them with water, on account of the terms of payment being too high; and they resolved to go in for an independent supply, to augment the existing one. They now complain that the contractor for the work has been dilatory; and as the supply to the inhabitants was getting meagre, they a short time ago took in an unfiltered supply from the Lochty Burn, and cancelled the contract. The situation is accentuated by there being an outbreak of typhoid fever in the town—which is a grievous matter, Carnoustie being a very popular watering-place.

The Corporation of Hamilton are contemplating the erection of sulphate of ammonia plant in their gas-works. They have procured information from a number of towns as to the questions of cost and freedom from smell; and being satisfied there is no objection on the score of the latter, they have taken time to consider the former point.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 9.

Sulphate of Ammonia.—The market remains pretty much as last reported; prices, however, tending slightly in the buyers' favour. There is very little change in the Hull market; but business is reported at Liverpool down to £14 10s. The quantities available are still very small; otherwise, the consumptive demand having entirely fallen away, a serious drop might be feared. October-March delivery is still held for £13 to £13 2s. 6d. But there are very few buyers; and it is generally expected that, after the end of September, a different state of things will be seen. This, however, will depend very much on circumstances. Meanwhile speculators seem to be selling ahead very freely.

LONDON, *Sept.* 9.

Tar Products.—During the past week, a fair amount of business has been done in the leading products. Sellers are asking 1s. 6d. for 50's and 90's benzol respectively; while buyers' ideas do not rise above 1s. 5d. Solvent naphtha is distinctly in better request; and important contracts for it have been made within the last few days. Carbolic acid occupies the anomalous position of being in excellent demand, while its value has slightly decreased. Stocks in speculative hands have been sold out; and manufacturers may expect to see higher prices. Large forward business is reported in pitch, at a slight advance; while creosote and other tar oils are now reported to be better, with stocks much less in makers' hands. Prices ruling during the week are: Tar, 12s. 6d. to 14s. Pitch, 24s. 6d. to 25s. 6d. Benzols, 50's and 90's, 1s. 5½d. Creosote salts, 16s. Creosote, 1½d. Solvent naphtha, 1s. 1½d. Toluol, 1s. 5d. Crude benzol naphtha, 30 per cent., 7d. Carbolic acid, 60's, 1s. 6d.; crystals, 6½d. Cresol, 1s. 6d. Anthracene, nominal, 30 per cent., "A," 1s. 1d.; "B," 9d.

Sulphate of Ammonia has dragged somewhat during the past week; and business has been done as low as £14 15s.; while £14 17s. 6d., less 3½ per cent., may be said to be to-day's value in all positions. Gas liquor is quoted at 9s. 6d. to 10s. 6d.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Any expectations that the ballot which has been taken by the Miners' Federation, and the results of which will be submitted to the conference to be held in Nottingham on Thursday, would have any appreciable effect in bringing about a settlement of the wages dispute, have been altogether dispelled by the attitude taken up by the Federation leaders, and the results of the ballots that have become known. It is more than ever evident that the dispute will have to be fought out to the bitter end; and some time next month is now talked of as the earliest possible date at which the pits are likely to get back to work. In the meantime, the position week by week becomes more serious as regards supplies of fuel; and although most of the gas-works in the district surrounding Manchester are fairly off for some time yet, here and there they have been placed in very considerable difficulty, and in odd cases have had to buy gas coal at prices more than double those at which they had previously made contracts. One gas-works has paid an advance of 8s. a ton to secure a supply of some 500 tons. With regard to fuel for steam and general manufacturing purposes, consumers have now to go largely upon the better qualities of house-fire coal, which are practically the only description of fuel held in stock; and for these they have, of course, to pay big prices. Screened round coals range from 16s. up to 17s. 6d. per ton at the pit-mouth; while for through-and-through coal, from 14s. 6d. to 16s. per ton has been obtained. Coal from

Durham and from Scotland is, however, coming into the district at prices which tend to keep down any very exorbitant advance at local collieries. Durham through-and-through coal has been obtainable at about 16s.; and nuts, according to quality, at from 16s. 6d. to 17s. 6d., with screened-coals about 20s. per ton, delivered into this district. Scotch coal is also being bought at reasonable prices—representing about 14s. 6d., delivered alongside in the Mersey; and Scotch slack has even been sent to the Garston Docks. As regards local supplies of engine fuel, these have been practically exhausted; and the few colliery-owners who have any slack to offer, are asking 12s. to 13s., and even 15s. per ton at the pit-mouth. These prices are necessarily leading to a more or less general restriction of manufacturing operations throughout the iron and engineering trades. The Lancashire blast furnaces are being damped down; and steel works are being closed. Finished iron works (with one or two exceptions, where they are just kept partially running) are stopped altogether; and several of the largest engineering works in the district are only kept just "alive," with the result that in addition to the miners who are not on strike, a very large number of the workmen in other branches of industry are being temporarily thrown out of employment. The prices now quoted for Lancashire steam coal are almost prohibitory, so far as the shipping trade is concerned, except for bunker purposes, as Scotch coal can be bought at several shillings under the prices asked for Lancashire coal delivered at the ports on the Mersey.

Northern Coal Trade.—The coal trade is now more irregular than it was; and so much of the business is done by special bargaining that any quotations of prices are difficult to get. On the one hand, there has been a partial exhaustion of stocks in Yorkshire, which has led to renewed inquiries here for some kinds of fuel; on the other hand, there has been a full commencement of work in Wales and in Scotland, so that orders have to some extent been withdrawn. Best Northumbrian steam coals are in full demand, at about 11s. 6d. to 12s. per ton; but large quantities of coal are being delivered at 8s. 6d., and from that up to the higher prices named. Small coals are steady, at 5s. per ton. Bunker coals are quieter, and are tending downwards in price. Household coals are in rather better demand, but still below the volume of inquiry at this time of the year. Gas coals are now beginning to experience a larger trade; and not only are the coals contracted for fully taken up, but there are many sales of odd cargoes to places that had supplies arranged from coal-fields on strike. The coals contracted for are at prices between 6s. and 7s. per ton, f.o.b.; but the sales of odd cargoes are generally at higher prices, varying with the needs of the consumers and the position of the collieries. Coke has been in good demand, at from 16s. per ton, f.o.b., for best Durham kinds for export; but there is no alteration in the price of gas coke. The production begins to increase, but so does the consumption also; and the stocks are in most cases kept well down at the gas-works.

Scotch Coal Trade.—All difficulty with the miners in Scotland may be said to be over. In the West, the men are working very diligently; and the Fifeshire men have accepted the 12½ per cent. advance offered by the masters, and work has been resumed. In the Lothians, those who were offered 10 per cent. advance have continued at work; and those who have not had that offer, have resolved to agree to arbitration. There has been a fall in prices all round; and already the masters in the West are considering the advisability of reducing wages, a meeting being called for Wednesday to consider the question. There is a good demand for all classes of coal. The prices quoted are: Main, 8s. to 8s. 3d.; ell, 9s. 6d. to 9s. 9d.; splint, 9s.; and steam, 11s. to 11s. 6d. per ton f.o.b. Glasgow. Shipments for the week amounted to 175,029 tons—an increase on the preceding six days of 9918 tons, and as compared with the corresponding week of last year of 17,903 tons. For the year to date, the total shipments have been 4,679,550 tons—a decrease as compared with the same period of last year of 358,828 tons.

Horwich Water Supply.—At their meeting last Wednesday, the Horwich Local Board decided to engage an engineer to report upon the available sources of water supply for this rapidly growing town, and to prepare provisional estimates for reservoirs of 20 million and 30 million gallons capacity.

Metropolitan Gas Company of Melbourne.—At the half-yearly meeting of the Metropolitan Gas Company of Melbourne, held July 28, a dividend at the rate of 14 per cent. per annum was declared, £5000 was transferred from the reserve fund (leaving that fund at £48,262), and £1230 was carried forward.

Extensions and Improvements at the Maidstone Gas-Works.—Owing to the rapid increase of business, the Maidstone Gas Company have recently found it necessary to extend their works. In addition to other improvements, they have had a new retort-house erected. It is 150 feet long and 70 feet wide, and is fitted with all the modern improvements. The stage-floor principle has been adopted; so that the regenerative system can be used. Another saving of labour will be effected by the use of West's coal elevating and stoking apparatus. The retorts number 96; space being reserved for future extension.

A New Water Reservoir for Bath.—Mr. I. J. Smith, one of the Inspectors of the Local Government Board, held an inquiry at Bath last Wednesday with respect to an application by the Corporation for power to borrow £30,000 for a water reservoir which is to be constructed in the Monkswood Valley, near the city. Mr. Fox, C.E., who had been consulted by the Town Council, gave some details regarding the proposed reservoir, which will have a capacity of 50 million gallons. The Inspector expressed the opinion that the city was now in the right way to obtain a wholesome supply of water.

A Water Scheme for Epsom.—The Epsom Local Board have recently been considering the report of a Committee appointed to submit a scheme for the water supply of the town. As a consequence, they have determined to advertise for tenders for the supply and erection of an engine, with necessary pumps, boilers, &c., complete—the engine to be capable of raising 50,000 gallons of water per hour to a vertical head of 300 feet, through about two miles of rising mains. Also for constructing a covered service reservoir capable of holding 60,000 gallons of water; for the laying of the necessary mains; and for boring and fixing various tube wells.

Kingsbridge Gaslight Company, Limited.—Under this title a Company has been registered, with a capital of £930 in £7 shares, to acquire the business of a Company constituted by deed of settlement in 1835, and to supply gas at Kingsbridge, Devonshire.

Improvement of the Bolton Corporation Water-Works.—At the monthly meeting of the Bolton Town Council last Wednesday, the proceedings of the Water Committee embraced a resolution to expend a sum of £20,000 in works of improvement.

The Burghs Gas Supply (Scotland) Act (1876) Amendment Bill was read the third time in the House of Lords last Wednesday; so it now only waits the Royal Assent to become part of the law of the land. The general provisions of the Bill as introduced—and it has not been materially altered during its various stages through Parliament—were noted in the JOURNAL for July 18, p. 135.

A Water Scheme for the Hemsworth Rural Sanitary Authority's District.—The Hemsworth Rural Sanitary Authority have adopted a scheme for the supply of the parishes of Ryhill, South Hiendley, Havercroft, Brierley, and Shafton with water from the Barnsley Corporation. The project is estimated to cost £5961, which sum includes about 13 miles of mains and a reservoir at Kingston Hill to hold 30,000 gallons. The price from the Corporation is to be 1s. per 1000 gallons.

New Romney in Darkness.—The streets of New Romney are now in darkness, owing to a dispute between the Town Council and the Gas Company. It appears that when the time for renewing the contract for lighting the public lamps came round, the Company requested an increased payment, as they alleged that under the old agreement they were losing money. The Corporation intimated that they could not pay more; and it was decided to substitute mineral oil for gas. Accordingly the Company cut off the supply to the public lamps, and the town was thus put in darkness. On Tuesday night, an attempt was made to illuminate the streets by candles; but the experiment proved a dismal failure.

Leigh Local Board Gas and Water Undertakings.—The Clerk to the Leigh Local Board has just issued the annual report on the working of the Gas and Water Departments. The profits from the gas undertaking for the year amounted to £2063; and the number of consumers on the books was 3136, or 199 more than at the close of the preceding year. The quantity of gas made was 85,350,000 cubic feet; sold, 80,611,100 cubic feet; and the amount unaccounted for was equal to 4·62 per cent. of the make. The quantity of coal carbonized was 7626 tons; and cannel, 523 tons—the average cost of coal and cannel, including cartage, being 11s. 3d. per ton, as against 12s. 3d. last year. On the water account, there is a small profit; and the undertaking is now, therefore, a paying concern.

Proposed Extensions at the Burnley Gas-Works.—The minutes presented by the Gas Committee at the meeting of the Burnley Corporation last Wednesday stated that they had decided to pull down the old retort-house at the gas-works, and to apply to the Local Government Board for power to borrow £4000 for the erection of new offices, sulphate works, and laboratory, £5100 for a new gasholder, and £5500 for additional purifiers. In moving the adoption of the minutes, Alderman Collinge, the Chairman of the Committee, speaking of the new retort-house, said they proposed to adopt machine stoking, which would effect a great saving annually; and as to the additions in the way of new sulphate works, gasholder, purifiers, &c., these would provide for all expected increases for six or seven years to come. The minutes were approved.

The New Water-Works for Lurgan.—The Lurgan Town Commissioners had under consideration yesterday week a proposal to apply to the Local Government Board for a sum of £5000 to complete their new scheme of water supply. Before the works were started, an estimate of the cost was drawn up by Mr. W. B. Bryan; and it amounted to £23,178. Some of the Commissioners, however, thought he had allowed too much on certain items; and they pared down the figures, and made the total £20,487. Although Mr. Bryan strongly urged them to raise the amount to £25,000, they asked the Local Government Board for power to borrow £20,000, and that body suggested that it should be increased to £21,000. It is now calculated that the sum needed to cover the completion of the work will be £25,526; and it has been agreed to apply for the additional £5000.

The Insurance of the Belfast Gas-Works.—In the report submitted by the Gas Committee at the meeting of the Belfast Corporation on the 1st inst., they recommended that £5000 should be placed to the credit of an account, to be called the insurance suspense account, in lieu of insurance on the works. Mr. Harrison questioned the wisdom of the Committee in writing off £30,000 from the capital account and putting by only £5000 to the credit of the insurance suspense account; and Mr. M'Cormick inquired how far the £5000 would go to re-establish the works if they were destroyed by an explosion. Mr. Young replied that it was absolutely necessary something should be done, as the insurance companies had refused to accept some portions of the works, except at an enormous rate. An arrangement was made to meet this; and if £5000 were set aside each year, a substantial sum would soon be forthcoming. The recommendation was adopted.

Fatal Accident at the Hastings Gas-Works.—On the 29th ult., George Nelson Johnson, who was working on a new holder which Messrs. Ashmore, Benson, Pease, and Co., are erecting at Hastings for the Gas Company, met with an accident which resulted in his death. At the Coroner's inquiry on the following Saturday, evidence was given which showed that the unfortunate man was working about 27 feet from the ground, and was in the act of re-arranging his staging when he fell. No part of the scaffold was broken, and all the boards were fastened down. Johnson, who was 53 years of age, was of steady disposition, had been in the same employ for nearly fifteen years, and was used to the kind of work on which he was engaged. After the accident, he was taken to the hospital, where death occurred early on the Thursday morning, and was due to hæmorrhage from rupture of the spleen. The jury returned a verdict of "Accidental death."

Nelson Corporation Gas Supply.—The Nelson Corporation, being desirous of having the entire gas supply of the district in their hands, have entered into negotiations with the private firm owning the Lomeshaye Gas-Works to purchase the plant. As there is a dispute as to price, the parties have agreed upon submitting the matter to arbitration.

Ottoman Gas Company, Limited.—The Directors' report and the accounts of this Company for the half year ending June 30 last show that the total income was £10,309, of which the gas-rental produced £8308. The balance of profit was £3062; and the net profit, £2909. The amount standing to the credit of the profit and loss account is £3362, out of which the Directors recommend a dividend at the rate of 7 per cent. per annum on both classes of shares. This will absorb £2625, and leave £737 to be carried forward.

Abolition of Meter-Rents at Salford.—At last Wednesday's meeting of the Salford Town Council, the Gas Committee recommended that the charge for the hire of gas-meters should be discontinued. Referring to the subject, the Chairman (Mr. Holland) stated that they had purchased their coal this year "pretty well," and hoped to be rather "flush of money." They desired, therefore, to get rid of this impost in the meantime, and he hoped, for all time. Hitherto the Committee had derived a revenue of £3000 or £4000 from this source. The recommendation was adopted.

Sales of Stock and Shares.—The high estimation in which the stock of the *Broadstairs Gas Company* is held locally is indicated by the fact that £150 of "A" stock, paying 10 per cent., recently changed hands for £330.——A new issue of 200 £10 shares in the *Bideford Gas Company* have lately been disposed of at from £14 to £14 7s. 6d.——Last Thursday week, 23 £25 shares in the *Southampton Gas Company* were sold by public auction at £37 and £37 10s. apiece.——At Plymouth last Thursday, 1000 £10 7 per cent. shares in the *Plymouth and Stonehouse Gas Company* realized from £20 1s. to £20 10s. The competition for the shares was very keen; and at these prices (which are excellent ones), the purchasers will only receive on their investment a trifle over 4½ per cent. per annum. The shares are under the sliding scale; and at the present charge of 1s. 9d. per 1000 cubic feet of gas (the standard price being 2s. 6d.), the nominal dividend is 9¼ per cent.

Electric Lighting for Dewsbury.—The Dewsbury Corporation having determined to put down an electric lighting installation, and to expend £25,000 upon it, Mr. F. H. Tulloch held an inquiry into the matter recently on behalf of the Local Government Board. The Town Clerk (Mr. E. Mawdesley) stated that the question of supplying electric light had been under the consideration of the Council for three years; and they had come to the conclusion that such an installation was necessary in the interests of the town. They found there was a demand for it, especially in the centre of the borough. From the commencement they had sought the best possible advice, and had employed Mr. W. H. Preece to prepare the specifications. The Corporation did not propose to expend the whole of the money immediately. Some of it was for extensions, supplying arc lamps, &c., which they did not intend to do at present, the streets being well lighted with gas. The buildings and plant at the central station, which was on the site of the old gas-works in Bradford Road, would be capable of being extended so as to meet all possible requirements. The Corporation had spent large sums of money on the gas-works, yet they believed that, by adopting the best possible system of electric lighting, and supplying it at a price which would enable persons to become customers who desired to do so, there would be a profit which would counteract any loss in connection with the gas-works. There was no opposition to the scheme.

Water Supply in the Kendal District.—Notwithstanding the fact that the normal rainfall in the Kendal district is usually in excess of the average of the country, Kendal and its neighbourhood have been greatly affected by the prolonged drought. As was recently stated in the JOURNAL (*ante*, p. 416), Kendal itself is much concerned about the insufficiency and the indifferent quality of its water supply; while, in the rural districts of the immediate neighbourhood, the condition of things is not less serious. A number of suggestions are put forward, with a view to remedying this state of things, and providing an adequate supply for future requirements. One is that a reservoir should be constructed in the Bannisdale Valley, situated six miles north-east of Kendal, and at a height of 550 feet above the town. It is stated that the rainfall there is not less than 60 inches per annum, and that, if a sufficiently large reservoir were constructed, 3484 million gallons of water could be impounded there yearly. Dr. Craven, the Medical Officer for the borough and the rural district, suggests this scheme; and it has been laid before the Town Council and the Rural Sanitary Authority, but has not been discussed by either. The Town Council at their last meeting decided to memorialize the Local Government Board to send down an Inspector at once to hold a local inquiry into the matter of the water supply. Several of the members strongly condemned the present sources of supply, and especially the inadequacy of the service. One of the speakers suggested that it was not necessary for the Corporation to act in antagonism to the Kendal Gas and Water Company; but they should insist on having a supply of pure water, whether the Company or the Corporation furnished it. The proposal of the Company to get a supply from Thirlmere was condemned as discreditable to the town, which had an excellent natural supply of its own, and ought not to be dependent on Manchester or to "undertake any part of the burden of that vast undertaking." The Rural Sanitary Authority appear, however, to have no such scruples. They have been making inquiries as to the cost of supplying water from Thirlmere to the village of Burton. The reply was that the cost of the water required could not be exactly determined until the works were completed. So far as could be judged, it would be 8·7d. per 1000 gallons for the first installation; when 20 million gallons came through the works, the cost would be reduced to 5·1d.; and when the quantity was increased to 30 million gallons, the cost would be 4d. It was stated that the necessary mains, &c., would cost about £1100; and it was decided to make an application to the Local Government Board for power to carry out the work.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 484.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apl.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c.	10	12—13	..	5 15 4
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	12 May	6½	Bombay, Limited	5	5¼—5¾	..	5 13 0
40,000	5	,,	6½	Do. New	4	3¾—4	..	6 10 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	217—222	..	5 3 7
180,000	,,	,,	8½	Do. New	100	163—168	..	5 1 2
220,000	20	15 Mar.	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	102–105[*]	..	4 15 3
320,000	20	13 Apl.	11½	British	20	42—44	..	5 4 7
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16*	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5⅝—6⅛	..	3 1 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	..	6 0 0
150,000	20	13 July	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	28 Apl.	12½	Commercial, Old Stock	100	243—248	..	5 0 10
165,000	,,	,,	9½	Do. New do.	100	185—190	..	5 0 0
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	230—235	+ 2	5 10 7
200,000	,,	,,	10	Do. 7 p. c. Pref	100	191—196	+ 1	5 2 0
75,000	Stck.	15 Mar.	10	Crystal Palace District	100	190—195	..	5 2 7
486,090	10	28 July	10	European, Limited	10	21—22	..	4 10 11
354,060	10	,,	10	Do. Partly paid	7½	15—16	..	4 13 9
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	223—223	..	5 5 3
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—100	+ 1½	4 0 0
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	261—266	+ 1	3 15 2
30,000	,,	,,	5	Do. F, 5 p. c. Pri.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175—180	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	168—173	..	4 0 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	260—265	+ 1	3 15 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	155—160	..	3 15 0
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	126—129	..	3 2 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	128—132	..	3 8 2
908,000	,,	,,	6	Do. 6 p. c. do	100	172—177	..	3 7 9
3,800,000	Stck.	12 May	12	Imperial Continental	100	223—228	..	5 5 3
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5—5½	..	5 9 1
560,000	100	4 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	104—106	+ 1	4 14 4
541,920	20	15 June	5	Monte Video, Limited	20	12¾—13½	..	7 8 2
150,000	5	31 May	10	Oriental, Limited	5	7½—8	..	6 5 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	4—4½	..	7 15 6
166,870	10	—	2	Pará Limited	10	2—2½	..	—
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	28 Apl.	5	San Paulo, Limited	10	8½—9½	..	5 5 3
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	292–297*	..	5 4 4
1,350,000	,,	,,	12	Do. B do.	100	240–245*	..	4 17 11
260,000	,,	,,	13	Do. C do.	100	247–252*	..	5 3 2
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	148—152	..	3 5 9
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210–215*	..	5 7 3
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	263—268	..	3 14 7
1,720,252	Stck.	29 Mar.	8	East London, Ordinary	100	213—218	..	3 13 5
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—145	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	110—113	..	3 15 2
708,000	Stck.	16 Aug.	11	Kent	100	275—280	..	3 18 6
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	239—244	..	3 17 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 6
310,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	129—132	..	3 0 7
500,000	100	16 Aug.	12½	New River, New Shares	100	325—330	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	149—154	..	3 18 0
126,500	100	,,	6	Do. D 7½ p. c. do.	100	140—145	..	4 2 9
1,155,066	Stck.	15 June	10	West Middlesex	100	258—263	..	3 16 0

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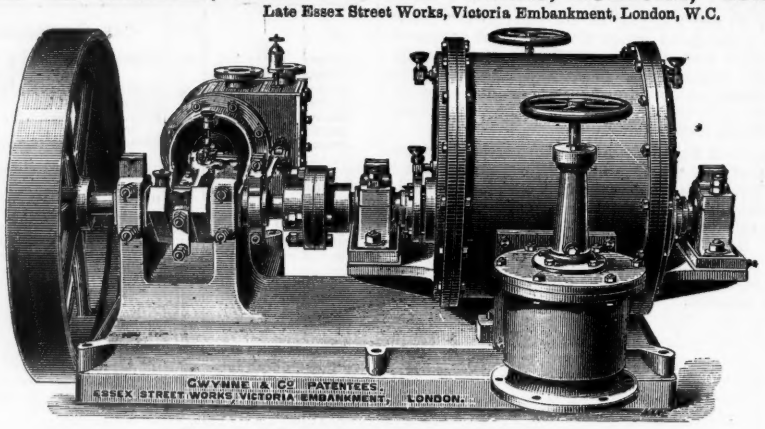

Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

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Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

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Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
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MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries. (See last week, p. 434).
Telegrams: "HUTCHINSON BROS., BARNSLEY."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

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*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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WANTED, a Situation as Fitter in a Gas-Works. Well up in Main and Service laying, Meter and Stove fixing; or would take charge of small Works.
Apply, by letter, to No. 2280, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, a good steady married Man (about 30 years of age), as WORKING FOREMAN for a small Gas-Works, making about a million cubic feet annually. Must be a good Gas-Fitter, and do Main and Service laying, repair Meters, &c.; must also be well up in the Manufacture and Distribution of Gas. House, Coal, and Gas provided.
Apply, in own handwriting, stating wages and age of applicant, with testimonials, to No. 2278, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

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THE Knaresborough Local Board require the services of a WORKING FOREMAN for the Gas-Works Department. Salary, £100 per annum.
Applications, in own handwriting, accompanied by three recent original testimonials, to be sent to me not later than the 12th inst.
ARTHUR W. GILLING,
Clerk to the said Authority.
Sept. 4, 1893.

WANTED, two Purifiers, 5 feet square or similar area, with 4-inch Connections.
Send full particulars to No. 2279, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

G. L. LAMBERT, 26, Alberta Terrace, Nottingham. Consultations, Advice, Reports in Various Branches of **Practical** Mechanical Engineering and Machinery. **Specialities** in Water, Sewage, and Gas Plant Making. **Surveyor** of Steam-Ships, Marine Engines, Boilers, and General Machinery. **Detailed Inspection** of Engineering Contracts during Manufacturing and Erection.

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FOR SALE—Four 5 feet Square PURIFIERS, in good condition, lying at Filey.
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FOR SALE, cheap—A round Station METER (6-inch Connections), with three Valves and Tees forming Bye-Pass. Is now being taken down to admit of a larger one being fixed.
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FOR SALE (immediate delivery)—A perfectly new GASHOLDER, 30 ft. by 12 ft., with wrought Tank complete. Design and Specification on application. Price cheap, including fixing where required.
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FOR SALE—A Round Station Meter, in excellent condition. Capacity, 8000 cubic feet per hour, with Clock, Tell-Tale, Inlet, Outlet, and Bye-Pass Valves, and Connections complete. Replaced by one of larger capacity.
Apply to the undersigned.
JNO. SWAN,
Engineer and Manager.
Gas-Works, Ulverston,
Aug. 28, 1893.

FOR SALE—Two Drawing and Two Charging hand-power STOKING-MACHINES by West's Gas Improvement Company, capable of working Retorts up to 6 feet from Stage Level, with a maximum charge of 3 cwt. per Mouthpiece. In thoroughly good working condition, complete with Travelling Scoops and Hoppers, spare Rake-Heads, Rods, Propelling Gear, &c., &c.; but with no Rails, Coal-Breakers, or Lifting Machinery.
To be seen at the Kent Road Works of the South Metropolitan Gas Company, and offered at a very low price.

SPECIAL BARGAIN.

FOR SALE—Two perfectly new Cast-Iron SCRUBBERS, 10 feet diameter by 50 feet high, with Wrought-Iron Domes, Cast-Iron Spiral Staircase, &c., complete. All plates machine planed. One or both Scrubbers will be sold to suit purchasers.
A perfectly new 30,000 per hour HORIZONTAL DOUBLE PUMP RECIPROCATING EXHAUSTER, with Steam-Engine, with Connections and Valves.
One Second-hand (thoroughly overhauled) VERTICAL PUMP EXHAUSTER, with Steam-Engine (with clean Water and Liquor Pumps attached), to pass 7000 cubic feet of Gas per hour.
The whole of the above Plant can be inspected, and full particulars with prices will be sent, on application to No. 2241, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TENDERS wanted for about 2000 tons of Flint Colliery CANNEL, in stock at Colliery. Price to include loading into Trucks. Analysis on application.
Apply to the NEW FLINT COAL AND CANNEL COMPANY, 5, Windsor Buildings, George Street, LIVERPOOL.

NORTHAMPTON GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Directors are prepared to receive TENDERS for the purchase and removal of the surplus TAR produced at their Works for a term of One or Two Years.
Quantity produced, about 2400 tons per annum.
Particulars may be had on application.
The Directors do not bind themselves to accept any tenders.
Tenders, marked "Tender for Tar," to be delivered at the Company's Offices on or before Tuesday, Sept. 19 next.
JOHN EUNSON,
Engineer.
Gas-Works, Northampton,
Aug. 30, 1893.

CORPORATION OF LEICESTER.

ELECTRIC LIGHTING CENTRAL STATION.
IRON ROOFING.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply and erection of two ROOFS, one 139 ft. long, 40 ft. span, and one 60 ft. long, 40 ft. span.
Drawings may be seen and Specification and Form of Tender obtained, upon application to the Engineer.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Roofs," to be delivered at these Offices, not later than Eleven o'clock a.m., on Saturday, Sept. 23.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M. Inst. C.E.,
Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Sept. 1, 1893.

CORPORATION OF CALCUTTA WATER-WORKS.

CONTRACT FOR PUMPING-ENGINE.

TENDERS are invited for the supply, delivery, and erection complete, at the Tallah Pumping-Station, of a DUPLEX DIRECT-ACTING CONDENSING HORIZONTAL PUMPING-ENGINE, capable of lifting about 22 million gallons of water 112 feet high in 24 hours.
Specification and Particulars to be obtained at the Offices of Messrs. JOSEPH QUICK AND SON, C.E., 36, Great George Street, WESTMINSTER, S.W.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

THE Directors of the above Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works for the Twelve months, commencing the 1st of October, 1893.
The tenders to state the price per ton for the Tar, and also the price per ton for the Liquor of 10 oz. Twaddell.
Both the Tar and Liquor will be pumped by the Company's Engines into the Contractor's barge alongside the Company's Wharf, situate at Egham, on the Thames.
All information may be obtained from the Manager, Mr. Thomas Webb, at the Works, and tenders must be sent to the undersigned, marked "Tar and Liquor," on or before the 4th of October next.
The Directors do not bind themselves to accept the highest or any tender.
By order,
JOHN ANTHONY ENGALL,
Solicitor and Secretary.
Staines, Sept. 9, 1893.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Windsor Royal Gaslight Company are prepared to receive TENDERS for the purchase of their surplus COAL TAR and AMMONIACAL LIQUOR (10-oz. Liquor) for One year, from the 3rd day of October, 1893.
The Tar will have to be removed in barrels; but the Liquor can be pumped into railway tanks on the Great Western Railway.
The Contractor must be prepared to keep the Company cleared of both Tar and Liquor, and to provide all the necessary barrels for the purpose.
The Directors do not bind themselves to accept the highest or any tender.
Any further Information may be obtained on application to Mr. J. Wadeson, Manager.
Sealed tenders, stating price at the Company's Works free of all charges, must be sent in by Twelve o'clock at Noon on Tuesday, the 3rd day of October, 1893.
By order,
JOHN HENRY STRANGE,
Secretary.
Gas Offices: Victoria Street, Windsor.

OTTOMAN GAS COMPANY, LIMITED.

NOTICE is hereby given, that the ORDINARY MEETING of the Shareholders in the above Company will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, E.C., on Tuesday, Sept. 19, at One o'clock, for the purpose of receiving a Report and Statement of Accounts from the Directors for the Half Year ending June 30, 1893.
The Transfer Books will be closed from Sept. 12 to 19, both days inclusive.
By order,
ARTHUR J. KING,
Secretary.
9, Queen Street Place, Cannon Street, E.C.,
Sept. 5, 1893.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 27th inst., at half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.
Notice is hereby also given, that the Transfer Books of the Company will be closed on the 16th and re-opened on the 28th inst.
By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.
Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 7, 1893.

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Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** The Act extends to Scotland and Ireland.*

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ALFRETON IRON-WORKS, DERBYSHIRE,

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BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

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Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

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A FIRST-CLASS CANNEL COAL,

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Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

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BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
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HARTON COAL COMPANY, LIMITED,
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Prices and Analysis on application.

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[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The
WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.
The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co. Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.
VALVES
FOR GAS, WATER, AND STEAM.
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THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
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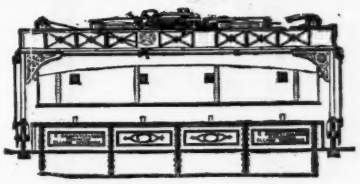
COKE BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
For Exhauster Advertisement, see last week.
GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

DEMPSTERS'



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MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

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FOR GAS PURIFICATION.
Two to three times as rich in Hydrate as Bog Ore.
STRONG ACTION ON SULPHURETTED HYDROGEN.
We have for sale Hydrate of Iron containing 77 per cent. of Ferric Oxide and 17 per cent. of Water. Directions given for mixing for Purifiers.
LESS THAN HALF THE PRICE OF BOG ORE.
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ALDWARKE MAIN GAS COAL
Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

WILLEY & Co.,
Gas Engineering Works, Commercial Road, Exeter,
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS.

GASHOLDERS, Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.
PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**
PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.
Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.
Special reference and attention are invited to our
WET AND DRY METERS,
which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

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NO PUTTY.

Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

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SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

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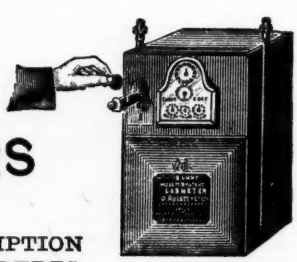

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SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

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RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

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THE LARGEST GASHOLDER IN THE WORLD.

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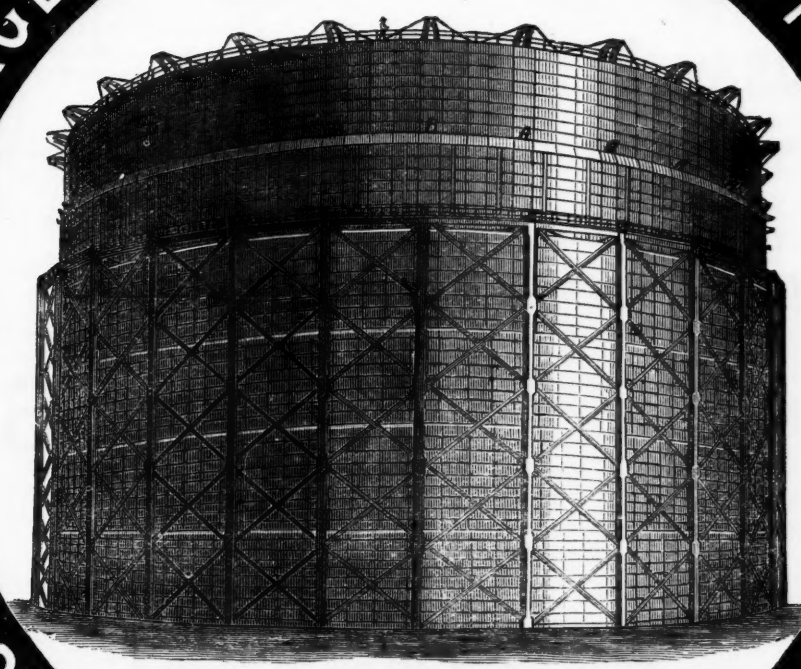

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE
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IT HAS SIX LIFTS 30 FT. DEEP EACH AND IS 300 FT. DIAR.

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Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS
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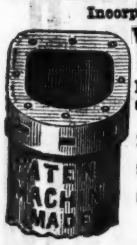

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1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES
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MANUFACTURED BY THE
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GODDARD, MASSEY, & WARNER'S
IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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The Apparatus has been supplied to the following Firms—

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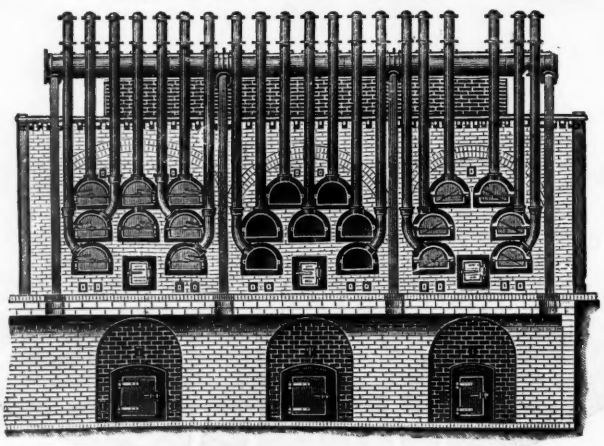
BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



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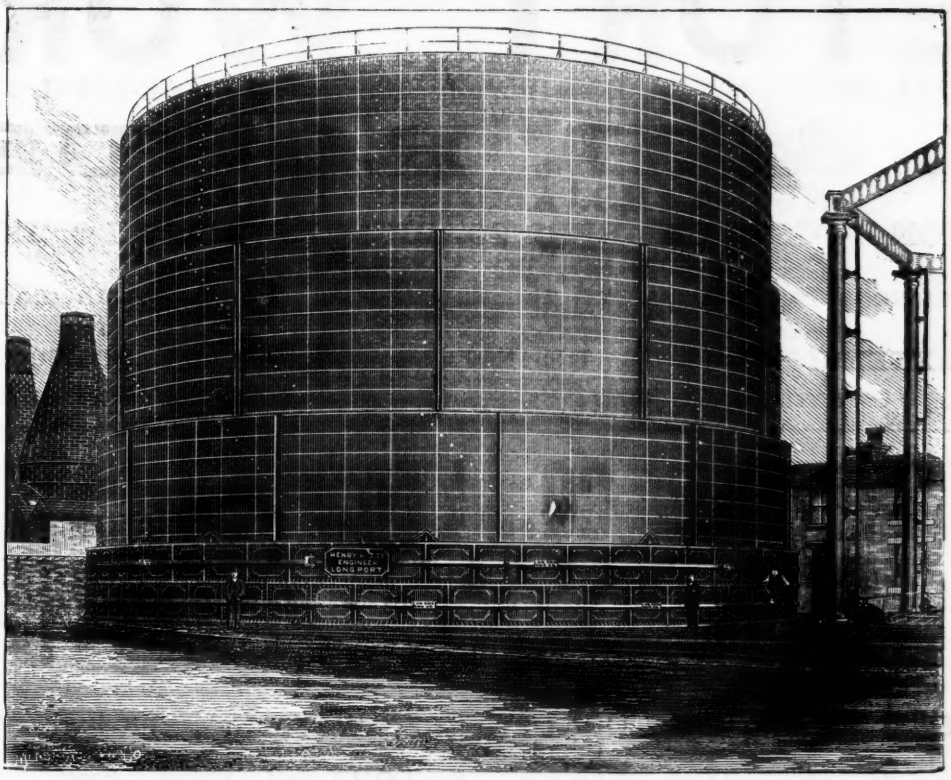
Makers of every kind of Gas Apparatus and Structural Ironwork.

Sole Licensees of

SPIRAL-GUIDED GASHOLDERS,

WHEREBY COSTLY GUIDE-FRAMING IS DISPENSED WITH.

Telegraphic Address: "SCRUBBER MANCHESTER."



Further Particulars and Estimates on Application.

Three-Lift Spiral-Guided Gasholder, working in a Cast-Iron Tank made with planed joints, erected at the Longport Gas-Works of the Burslem Corporation. Bottom Lift, 90 ft. diameter and 20 ft. deep.

NOTHING SUCCEEDS LIKE SUCCESS.

Upwards of thirty Gasholders have now been erected or ordered upon this System; and their stability has been proved under the most varied conditions. A list of these will be sent on application.

The reader's attention is invited to the fact that our position as Makers of SPIRAL-GUIDED GASHOLDERS, THE SAFEST AND BEST of the several types of Columnless Gasholders, has not been modified by any recent adjustment of legal proceedings.

IMPORTANT TO ENGINEERS AND GAS COMPANIES.

A NEW CARBURETTOR FOR ENRICHING GAS IN BULK.

The Carburettors have been doing practical work for the past two years; in many cases doing all the enrichment without the use of Cannel or other rich Coals. The South Metropolitan Gas Company have these Enrichers at all their Stations. The Gaslight and Coke Company have had them in use at some of their principal Works for two years past; and several more are now being fixed at their other Stations. The Carburettors are also in use at several Suburban and Provincial Gas Companies' Works.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

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RETORT WORK

HORIZONTAL, INCLINED, REGENERATIVE, GENERATIVE, OR FLOOR-LEVEL SETTINGS.

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ARE PREPARED TO ENTER CONTRACTS

FOR EXTENSIONS OR RENEWALS OF THE ABOVE WORK DURING THE ENSUING SEASON.

PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED

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Contractors for the Erection of Gas-Works complete, including Gasholder Tanks of all sizes and Main Laying.

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PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES

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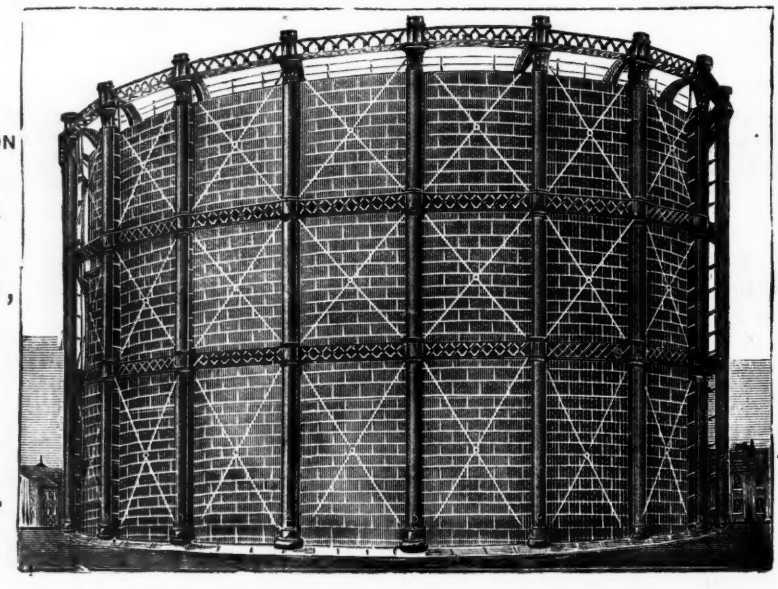

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RIKY'S OXIDE (formerly worked by Messrs. Stanley and Olphert).

THE LARGEST SUPPLY OF OXIDE IN HAND OF ANY OTHER FIRM IN THE WORLD.

Purity and Uniformity of Qua ity Guaranteed.

RIKY AND CO. can supply the above at a much lower rate than any other firm in the trade, being owners of the property where it is found. *No Middleman* or *Agent* receives a profit.

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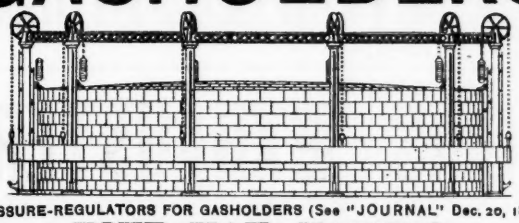

PRESSURE-REGULATORS FOR GASHOLDERS (See "JOURNAL" Dec. 20, 1892.

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AND ALL CLASSES OF GAS APPARATUS.

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The Climax of Regenerative Gas Lighting!!

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A 280-CANDLE POWER

PLAIN IRON LAMP,

CLASS A— **55/-**

LIGHT for LIGHT

less than half the price of any other Regenerative Lamp.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

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PRICES ON APPLICATION.

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IMPROVED GASHOLDERS AND BOILERS

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Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

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IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

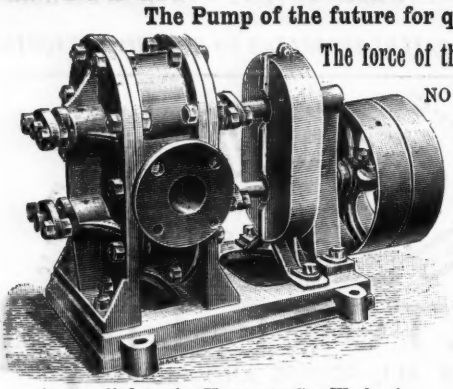
JOHNSON'S PATENT

DRUM PUMP AND GAS EXHAUSTER.

The Pump of the future for quickly and economically moving large bodies of Water.

The force of the Piston Pump with the capacity of the Centrifugal combined.

NO SLIDES OR FRICTIONAL WORKING PARTS.



As supplied to the Harrogate Gas-Works for Pumping Gas Liquor.

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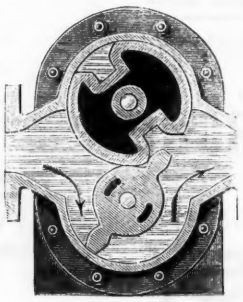

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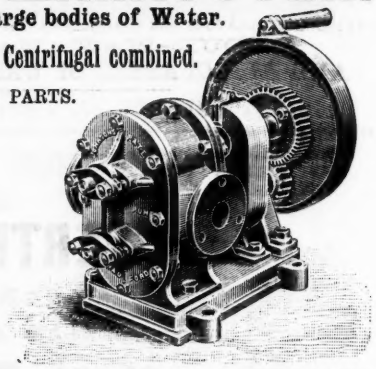

As supplied to H.R.H. the Prince of Wales for Pumping Gas Liquor at his Sandringham Gas-Works.

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Hydraulic and Pneumatic Engineers, 55, ATHOL ROAD, BRADFORD.

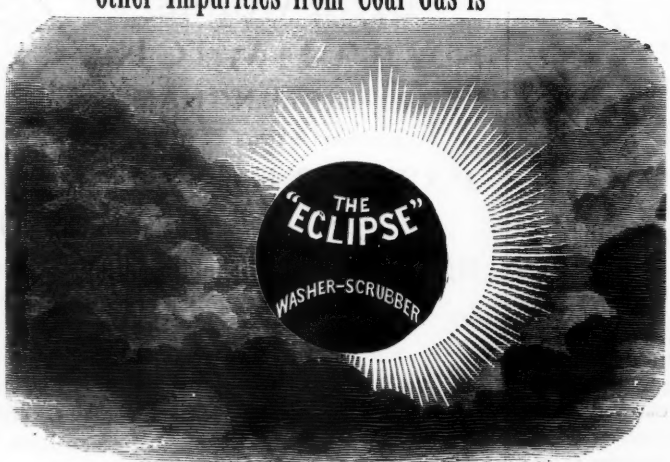
CLAPHAM BROTHERS, LIMITED,

ESTABLISHED 1837.

The most efficient Machine known for extracting Ammonia and other Impurities from Coal Gas is

KEIGHLEY, YORKS.

WELLINGTON, NELSON, & MARKET ST. WORKS.
Telephone No. 2238.
Telegraphic Address: "CLAPHAM BROTHERS Keighley."



Laycock and Clapham's Patent.

The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

The Shaft Revolves in Improved Bearings, and all Workings are accessible.

REPAIRS AND TROUBLE REDUCED TO A MINIMUM.

MAKERS OF

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With Lutes Cast and Planed Joints

CONDENSERS,

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London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London,—Tuesday, Sept. 12, 1893.